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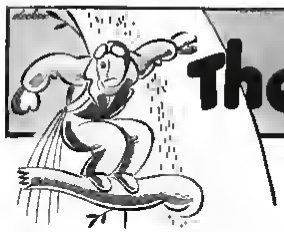
AVIATION

The Oldest American Aeronautical Magazine



The Birdmen's Perch

Ammen, this is your page. Use it to find out about old friends, to pass on gossip, to have your say so about the industry. *The space is yours—to do with as you wish.* Contributions, suggestions and criticisms will be welcomed. Address all correspondence to

MAJOR AL WILLIAMS, *Manager Aviation Department*
Gulf Refining Company, Pittsburgh, Pa.

DOES anybody know the whereabouts of Charles Augustus Macatee III?

Charlie was a dead ringer for a certain famous flier with a pretty similar name. Every time he landed at an airport crowds used to collect and whoop it up.

Charlie was a smart airman in his own right. He invented and installed the first traffic lights at any flying field, and I guess he got fed up with being taken for another flier and disappeared.

Recently I heard that he was a pilot for an eastern airline. Can anyone tell me whether this is true?

Incidentally, your Gulf Aviation Gasoline is the finest fuel I ever put in a tank. —J S

Let's get the PWA boys busy taking down all overhead wires around airports. They're a menace and they certainly ought to be buried underground. —R R

LOST!

At the Cleveland Municipal Airport, a pair of hand-knitted mittens. On the inside of the mittens are stitched these words: "With love, Emma." Emma thinks that I lost them on purpose and is not speaking to me. —Q V C

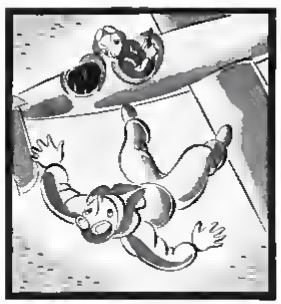
DID YOU KNOW?

That a German inventor worked out and, in 1899, patented designs for a balloon to be drawn by pigeons.

That the patron saint of the Caterpillar Club should be one Fauste Veranzio, who jumped from the top of a high tower in Venice in 1617, wearing a harness connected with a canvas-covered framework. Signor Veranzio survived.

That the first cross country flight from the Atlantic to the Pacific was made by C. P. Rodger in 1 Wright biplane in 1911, with many stops, and took 49 days.

That the World's Best Oil for Airplane Motors is Gulf's Alchlor processed *Gulfpride*, which forms only one fifth the carbon of the next best oil made.



ARE WE BEING SPOOFED?

I am told that several years ago at a county fair in the middle west a pilot was doing some stunt flying and was thrown from the plane while making a loop. His passenger, who had never flown before, grabbed the stick, did some plain and fancy experimenting with the controls, and finally brought the ship safely to earth.

Can anyone verify this story for me, or is it a yarn? —H G

FOUND!

Two New Champions at 1935 National Air Races: *Gulf Aviation Gasoline and Gulfpride Motor Oil.* Harold Neuman Thompson Trophy winner, and Bennie Howard, leader in the Bendix Trophy race, piloted planes fueled by this marvelous gas and lubricated with this amazing oil. This is the first time any refining company has so outdistanced the field in these two extremely important races.

THIS MONTH'S WHOPPER

Last week on one of my regular hops from Chicago to Kansas City, one of the passengers complained that we did not serve enough butter with her meal.

The stewardess told me about it, so I pulled the ship down low and headed for a pasture.

The cows there started running and I chased them round and round the field. I finally got them going in circles, then spinning like a top. After about an hour I quit chasing them and landed.

Then I started milking one, and sure enough, I got butter instead of milk. I churned the milk by chasing them.

I brought back a good pound of butter to the lady, but she wouldn't eat it because she liked only Guernsey butter and these cows were Holsteins.

On top of that, she reported me to the company.

Now I am milking cows for a living.

—Former Pilot

The above reminds me that Pilot K. C. V. says that after 100 flying hours in an engine, *Gulfpride* motor oil is still so clean that you could spread it on bread and eat it. It is the only oil, he says, that he has ever found so clean.

Boy, some pampernickel!!

GULF REFINING COMPANY

GULF

refiners of fine aviation products

This Issue

DESIGN AND PRODUCTION

TRANSPORT

ARMY AND NAVY

PILOTS AND FLYING SERVICES

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AVIATION

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Louis F. Stull, Vice-President
S. Paul Johnston, Acting Editor

Leslie E. Neville, *Managing Editor* · Daniel Sayre, *Assistant Editor* · David J. Leink, *Art Director* · Paul Wooton, *Washington*

★

Contents for January, 1936

Volume 35 Number 1

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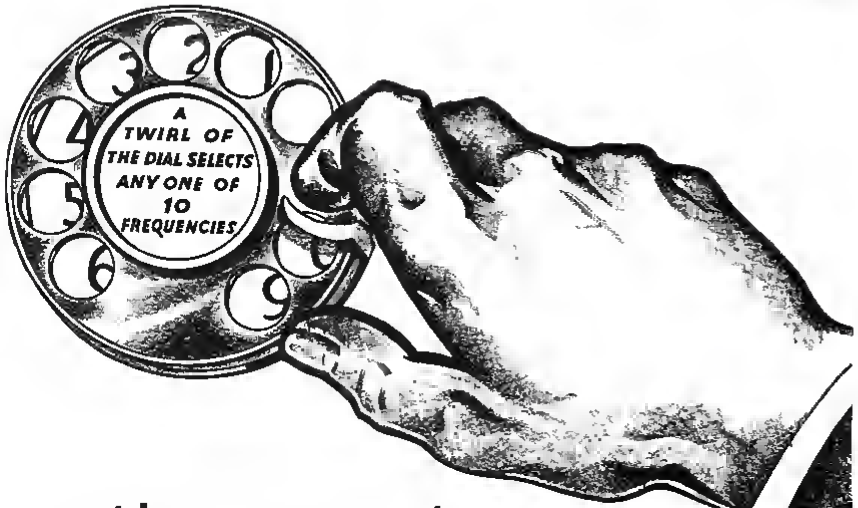

. . . with new transmitters installed by CHICAGO & SOUTHERN Air Lines

THE Western Electric 14B crystal controlled Radio Transmitter provides 10 preadjusted operating frequencies in the range of 2 to 18.1 megacycles. The shift from one frequency to another takes from ½ to 1½ seconds—is made by simply twirling a telephone dial—does not interrupt communication service.

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Developed by Bell Telephone Laboratories, this latest and most flexible Western Electric transmitter leads the way to still more dependable airline communication.

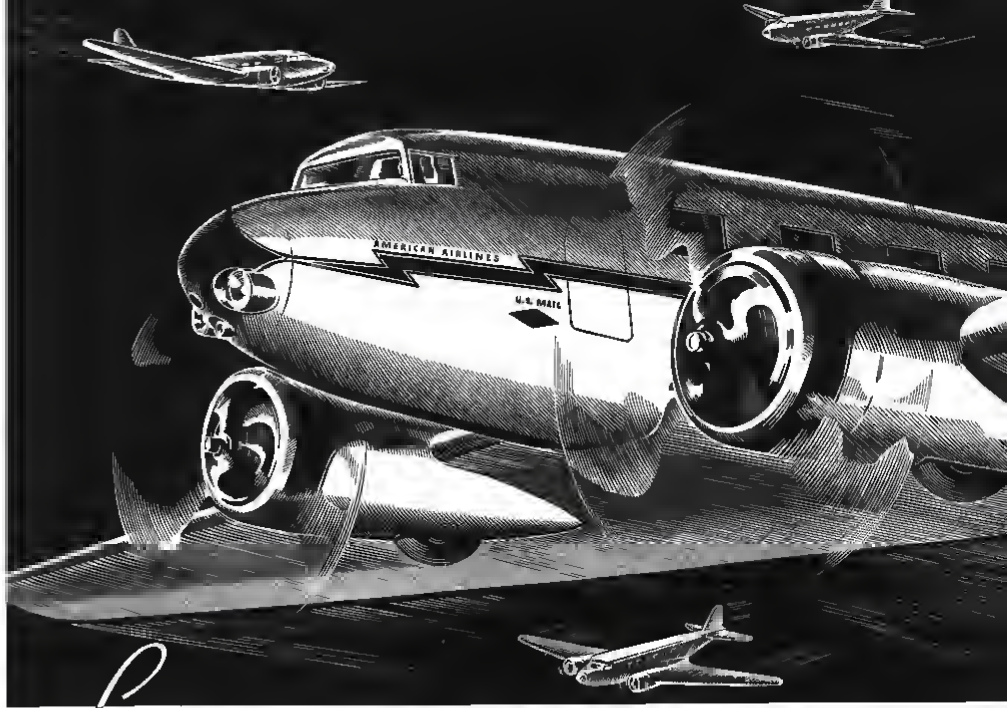
For full information, write to Western Electric Company, Dept. 299A, 195 Broadway, New York

St. Louis ground station of Chicago & Southern Air Lines. 400 Watt Western Electric 14B Transmitter at right, 9B Rectifier at left, control apparatus in center. Western Electric remotely controlled Receiver (not shown) is also used. Chicago & Southern operates similar installations at Jackson, Miss., and Memphis, Tenn.

Western Electric

Northern Electric in Canada

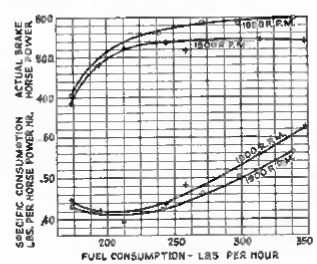
TWO-WAY AVIATION RADIO TELEPHONE AND TELEGRAPH EQUIPMENT



Low FUEL CONSUMPTION *with* ADVANCED CYCLONES

Lower fuel consumption now supplements the recognized low maintenance costs of the Wright Cyclone—established by 550,000 hours of airline operating experience. Continual refinement in the design of the standard Cyclone has reduced fuel consumption to the lowest values ever obtained in flight operation with an established air-cooled engine.

The curves illustrate a flight demonstration of the extremely low fuel consumption characteristic of the Advanced Cyclone. These results were obtained by flying at constant throttle and progressively leaning the mixture strength. No detonation resulted, and head temperatures never exceeded 405° F. on a warm September day. A cruising-power fuel consumption of no more than .42 lb. per brake horsepower hour was easily obtained and some readings were even lower—a record low consumption for a standard type of gasoline engine.



This outstanding performance was obtained by using regular 87 octane gasoline without any special equipment except the Cambridge mixture indicator which was introduced last year by Wright engineers to assist operators to obtain the best fuel economy. The test typifies the advanced engineering which has produced the world's leading aircraft engine — the WRIGHT CYCLONE.

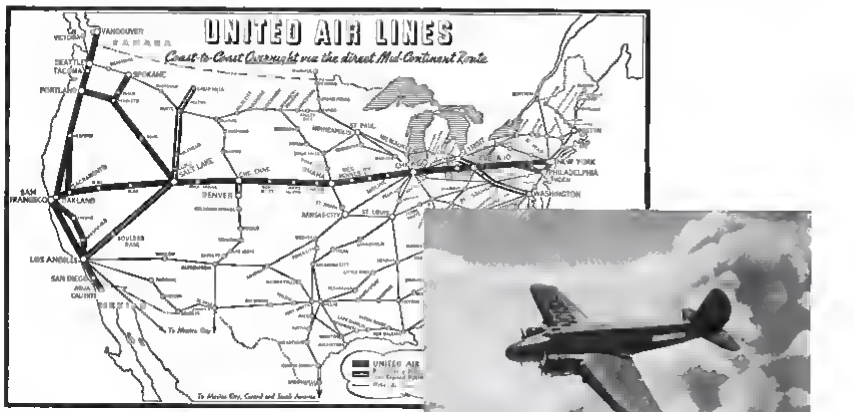
WRIGHT

AERONAUTICAL CORPORATION

PATERSON NEW JERSEY

A DIVISION OF CURTISS-WRIGHT CORPORATION

United's 1½ Million Miles a Month—



A Real Test of FAFNIR Stamina

". . . I take this opportunity to express to you our real satisfaction with the efficient performance of the Fafnir Bearings used on our fleet of 49 high-speed Boeing transports," writes Mr. D. B. Colyer, Vice President of United Air Lines. He goes on to explain:

"Fafnir Bearings are used throughout the plane's control system, both in the operation of the control surfaces and in the engine controls. Our Maintenance Department reports the bearings are performing excellently and, although we fly our planes a total of 50,000 miles daily over the Mid-Continent route and up or down the Pacific Coast, we have never experienced the slightest difficulty from Fafnir Bearings.

"For your information, United Air Lines has flown its twin-engined Boeing transports nearly 30,000,000 miles and the new model planes are adding a million and a half miles monthly to this total.

"I believe that our extensive operations furnish a very effective test of the stamina of Fafnir Bearings."

"Satisfaction" in airplane bearings means such factors as unchanged "feel" . . . longer cable life . . . minimum inspection or greasing . . . all of which are inherent benefits of Fafnirs—the standard of aircraft control bearings.

For detailed information on types and sizes, write to The Fafnir Bearing Company, Aircraft Division, New Britain, Conn. . . . Atlanta . . . Chicago . . . Cleveland . . . Dallas . . . Detroit . . . Kansas City . . . Los Angeles . . . New York . . . Philadelphia

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Safeguarding Quality

FAFNIR BALL BEARINGS

Continuous Development

Haw improvement in engine and aircraft perfarmance has been anticipated by Hamiltan Standard developments.

1925

Homilton Standard odjustable-pitch metal propellers come into general use, supplanting fixed-pitch propellers.

1930

First entirely procticable controlloble-pitch propeller designed and flown by Hamilton Standard.

1933

The Hamilton Standard controlloble-pitch propeller odopted as an essential item of equipment on high performance aircraft. Awarded the Collier Trophy as the greatest aeronautical achievement during 1933.

1934

"Constant-speed" control for Homilton Standard controllable-pitch propellers developed and successfully opplied to multi-motored ships.

1935

Hamilton Stondard constant-speed propeller adopted as standard air line equipment + + Is flown across the Pacific and back on the China Clipper + + Is used on flight establishing new world's landplane speed record.

1936

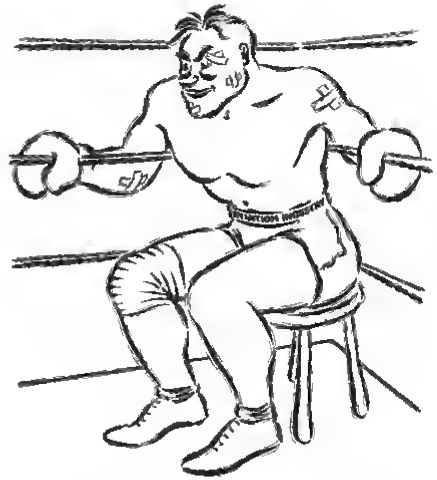
"Continuous development."

HAMILTON STANDARD PROPELLERS
Eost Hortford, Connecticut
DIVISION OF UNITED AIRCRAFT MANUFACTURING CORPORATION

AVIATION *for January, 1936* ★ ★ ★ ★ ★ ★

Recovered from the staggering blows of 1934, aviation looks back over 1935 with satisfaction, ahead into 1936 with high hopes.

1935, Round by Round



No other industry in the world has ever shown such a capacity to take it and come back for more as has aviation in these United States during the past two years

WHEN, a year ago, we called 1934 "the year in which the crack of doom proved only to be a starting gun," we had to admit (privately) that perhaps we had overshot a little. Not that there were not grounds aplenty for optimism at that time, but we were acutely conscious that the reverse of the picture was still pretty black, and we weren't at all sure then that someone wouldn't turn it around suddenly.

The early months of the year proved far from reassuring, and the mantle of prophecy that we had assumed seemed to shrink about our shoulders until our neck was well out beyond its protecting folds. When the report of the Federal Aviation Commission, product of a prodigious labor, was allowed to freeze to death, a foundling on the White House doorstep, our hopes for the immediate future almost scraped bottom. By early summer, however, the amazing recuperative powers of this aviation business became evident to everyone, and by the end of 1935 we find the entire industry firmly on its feet, facing forward with an optimism that has never before been as completely justified.

One of the brightest spots in the picture for the coming year is air transport. Every indicator points definitely upward. Improvement in airline speed, safety and comfort is being reflected in widespread acceptance of the airline as a means of travel, an acceptance that has rolled up a total passenger mileage for 1935 almost double that of 1934. Modernized equipment has been largely responsible. Large and small lines alike, recognizing the economies and traffic building appeal of the newer ships, have scrapped their obsolete equipment and purchased up-to-date planes. But equipment considered the last word less than a year ago, is already becoming outmoded in the minds of operators and manufacturers. Sixteen-passenger sleepers, 20 and 40-passenger day planes, are well through the engineering stages. Some are undergoing flight tests (see page 28), others are under active consideration. A re-equipment program on a wide front is now being undertaken by all the major airlines and may be expected to bear fruit in the form of new ships in service by the spring of 1937. Add to this Army and Navy requirements, and an improving private demand of which we shall speak presently, and 1936 bids fair to be a busy year for all airplane, engine and accessory manufacturers.

Although it is too early to go into detail, some of the 1936-37 improvements in air transport equipment are easily predictable. The economies of high altitude flight are now so well recognized that cruising levels will be pushed steadily higher. Engines will operate more economically and more reliably, and will be capable of delivering extraordinary bursts of power for take-off, especially as higher grades of gasoline become commercially available. Wear and tear will be reduced, and the length of time between overhaul will be materially extended as newer types of lubricants, now available in the laboratories, come onto the market. Automatic control gadgets—for mixture, for propeller, for supercharger, and for lubrication—will tend to simplify the work (already too complicated) of pilots and maintenance men.

Most dramatic is the development of overseas air transport. The great networks of airways developed by each country within its territorial boundaries, or to interconnect outlying colonies, are at last being linked together to form the great world trade routes of the air. By the end of 1935, certain of the connections are already established. The French, the German, and latterly the

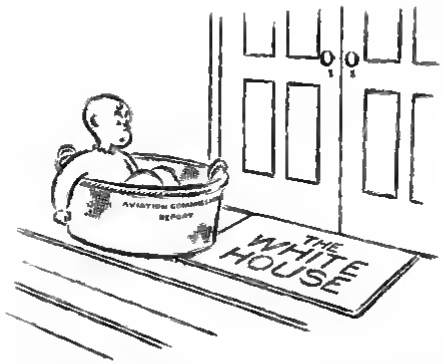
Dutch have been flying the South Atlantic regularly for some time between Africa and Brazil, and as the year closes, Pan American Airways has brought into being, after four or five years of intensive research, a regular service across the Pacific. April saw the pioneering Pan American Clipper (S-42) to Honolulu and back. Succeeding months pushed the exploratory flights to Wake and Midway, and to Guam by mid-October. Finally (Nov. 22-29), the China Clipper (Martin 130) made her maiden Pacific voyage to Manila, followed closely (in December) by her sister ship, the Philippine Clipper. So far, mail and crew have made up the ship's complements, but early in 1936 passenger service will be offered.

With the Pacific and South Atlantic links in actual operation, attention turns naturally to the toughest assignment of all, the conquest of the North Atlantic. Many people have flown the North Atlantic under carefully selected conditions, but a regular scheduled service is an entirely different problem, at least over the more northerly routes. Numerous surveys have indicated that the most feasible airway is by way of Bermuda and the Azores. It seems only natural that the development of this route should fall into the hands of Pan American and Imperial Airways. Negotiations have long been under way, and within the last few weeks have developed to a point where a joint transatlantic service within a year seems probable.

Military aviation

For the fiscal year 1935-36, the Army and Navy had between them some $52,000,000 to spend for new flying equipment. It is difficult to predict what the 1936-37 appropriation will be, but substantial increases are to be expected, estimates running as high as a $75,000,000 total.

If actual delivery of new units to the Air Corps be accepted as the criterion of progress, the year 1935 must be written off as a loss. If, on the other hand, we look into the matter of the development of newer and better types which should lead to quantity deliveries to tactical units next year, the picture is not quite so bad. Under the current procurement plan, a number of contracts are about to be awarded as the year ends. As we write comes word of a commitment for 100 new Northrop attack ships supplementing an order for 110 of the same make placed earlier in the year. Also (Dec. 22) comes announcement that an award has been made for 90 twin-engined bombers to the Douglas Aircraft Company, and an experimental order of thirteen of the four-engined 299 bombers to the Boeing company. (The original Boeing 299 was destroyed in a crash at Dayton in November, but official investigation brought out clearly that no failure of



Finding a bundle on his doorstep one cold day last winter the President said "I cannot deny it. It is as I wished. Send this to Congress to dispose of as rapidly and effectively as possible." It was delivered to Congress and has never been heard of since. It was the report of the Federal Aviation Commission.

structure or engines had occurred.) Beyond these actual commitments active design competition is now under way, and in some cases examples have been presented for evaluation.

Outstanding change in Air Corps organization was the setting up of the General Headquarters Air Force with headquarters at Langley Field under the command of General Andrews. Following the recommendation of the Baker Board, this new arrangement concentrates under a single command most of the active combat ships of the Army's Air Corps. With bases at four widely separated points throughout the United States, the G.H.Q. air force constitutes a highly mobile striking force, the first line of our air defense. Another forward move was the signing of the Wilcox defense bill by which the Air Corps is given authority to locate, acquire and develop air bases of strategic importance anywhere in the country.

The Navy year was marked by the placing of two very large contracts and a number of smaller ones. Consolidated Aircraft received an order for $8,500,000 for 60 long-range patrol boats, the largest single order ever placed for aircraft in peace time, and Curtiss-Wright received an order for $2,750,000 for scouts. Work has been gotten under way in Philadelphia for the production of 10 per cent of the Navy flying equipment in the Naval Aircraft factory, as provided by the Vinson Bill, but as of the close of the year, only one airplane had been turned out, and that a training type.

The Navy conducted extensive maneuvers during the year, largely in Pacific waters. In long range patrol work a number of outstanding flights were made. The giant Hall flying boat XP2H-1 made a non-stop cruise from Norfolk to Coco Solo in January. Two patrol squadrons completed two Alaskan surveys, and later in the year XP3Y1, prototype of the 60 Consolidated ships now on order, set a new world's distance record with a run from Panama to San Francisco, some 3,387 miles in 33 hours 45 minutes. The Navy's lighter-than-air activities came to an abrupt end with the loss at sea of the dirigible "Macon" off the coast of California during February maneuvers.

Research and design

Fundamental research went forward apace, largely under government supervision in the NACA laboratories. Latest addition to the equipment at Langley is a vertical wind tunnel for the study of spinning models. Investigation of various high lift and lateral control devices has been continued by the flight section, and a great deal of work has gone forward on compression ignition engines in the power plant laboratories.

Most important work done outside the laboratories during the year has been the high altitude research conducted chiefly by the late Wiley Post and, more recently, by D. W. Tomlinson, under the sponsorship of TWA. A great deal has been learned as a result of this work about the performance of aircraft and engines in the sub-stratosphere. Records were also made of physiological effects of oxygen deficiency and exposure to subnormal pressure.

Airplane and engine design follow the general trends laid down over a year ago. Transport types being built currently are of the twin-engined low-wing all-metal monoplane variety. It

is probable, however, that the airplanes of 1936-37 will be four-engined types, at least for long-range, high capacity work. For feeder, taxi and possibly for charter service, the popular airplane of the next two or three years will probably be a two-engined type seating anywhere from eight to twelve people.

Manufacturers of airplanes for private and industrial owners found reason to feel more optimistic. Although total business for the year was not phenomenal, definite gains were registered by many producers. There was evidence of reviving interest in plane ownership, plus an improved capacity to buy that was encouraging. One producer of a light plane had the best year in his history, turning out over 200 units in the twelve months. All signs point toward generally improved marketing conditions for the spring of 1936.

Light planes

Great furor arose last year over the Department of Commerce light plane development program, a subject which we summarized in our December, 1935, issue. Whatever else may have been said for the program, it did produce several airplanes of unconventional types, some of which show signs of promise. The Weick (see page 17), the Hammond and the Waterman are typical examples. How much farther they can be developed, or whether they constitute any new answer to the private pilot's problem must still remain an open question.

An effort was made during 1935 (under Department of Commerce sponsorship) to adapt automobile engines for aircraft use. Enough work has been done to demonstrate that it is perfectly possible to modify a production automobile engine and fly it in an airplane. Approved type certificates have been issued for at least two conversions. That the cost in dollars may be well below that of current aircraft engines of similar horsepower is reasonably well established, but aircraft designers are not yet convinced that they can accept the additional cost in pounds without seriously hampering performance or safety. With the best conversions available today, the specific weight runs better than 5 lb. per hp., well beyond that of the once popular OX-5.

Airports

Airport minded communities found new hope in the WPA construction program for new fields and the improvement of old ones. About 300 good fields, plus major improvements at important terminal airports constitute the announced WPA goal. Essential difference between WPA and its predecessor alphabetical combinations (CWA and PWA) is the provision that substantial percentages of allotments may be spent for materials, a hopeful sign for manufacturers of airport equipment.

Applications totaling more than $80,000,000 have been filed at Washington WPA headquarters, but Air Commerce Bureau's blue pencil will undoubtedly adjust individual grants, mostly downward. A possible joker is the provision that final disbursements of funds is controlled by local WPA administrators. If relocation of the municipal disposal plant or renovation of plumbing in the mayor's office are alleged to offer greater employment-relief possibilities than the proposed airport, funds may be diverted from aviation channels. This puts it squarely up to those interested in aviation in every community to make every possible effort to sell local WPA authorities on the advantages of adequate aircraft landing facilities.

Looking beyond the WPA program, new symptoms in airport development appear. A program for the establishment of new seaplane bases in coastal cities has been inaugurated under the sponsorship of the Aeronautical Chamber of Commerce. State, as well as federal airports and airways may be extended in the near future, supported in some cases by taxes on aviation gasoline. A federal bill providing appropriation for airport projects may be introduced in the next Congress.

Primarily to assist airport managers in their efforts to benefit by the WPA program, the airport committee of the Aeronautical Chamber of Commerce departed from its practice of holding a single meeting and took the annual conference out on the road. Beginning in Washington last June, meetings were held in Boston, Detroit, Kansas City, Portland, San Francisco, Los Angeles, and Birmingham. Birmingham was the climax, the national meeting. This arrangement made it possible to run meetings of the fixed base operators' committees at the same stops. Interesting exchanges of ideas resulted and valuable regulatory recommendations were made to the Bureau of Air Commerce and other government bodies.

Although the flying service division of the industry was late in beginning its climb out of the depression, it has made remarkable progress in 1935. Student permits issued (time-worn index of non-transport aviation activity) began to soar last spring and, by fall had reached 23,000 as compared with 13,000 for the same month last year. The short hop business staged a remarkable comeback and did much to help operators keep their equipment busy. Continued activity in used plane sales has indicated the demand for lower priced equipment and new plane sales in the light plane class reached encouraging heights. An important sales stimulant has been the introduction of workable time payment plans requiring one-third down, balance in twelve installments, and costing the borrower about 20 per cent including insurance.

The record of the racing in 1935 was disappointing, to say the least. Neither at Cleveland nor at Miami was any evidence to be found of new design development. Speeds generally fell below averages of prior years. In the field of international records, however, improvement was marked. With the encouragement of the NAA and other agencies, the standing of the United States in FAI records was greatly improved. Elsewhere in this issue (page 52) will be found an account of the international record situation as it existed at the year's end.

It seems only natural that the development of the North Atlantic route should fall into the hands of Pan American and Imperial Airways.

Design and production of aircraft in Germany are practically on a war-time basis. Methods differ radically from those with which we are familiar. In his second article Mr. Allen tells of visiting several famous factories.

New Wings for a New Germany

By Edmund T. Allen
Consulting Aeronautical Engineer

Wide World

A pair of Heinkel single seaters of Germany's new air corps Note the Daimler-cooled engines with tunnel type radiator between the landing gear struts.

Visitors at the Heinkel plant Left to right: (1) Dr Wimmer, Vice-President, D V L ; (3) Dr Lachmann, of slotted wing fame; (4) Dr Heinkel (5) Hall Hibbard, Chief Engineer of Lockheed; (6) Hubert Schweneke, Chief, Inventions Branch, German Air Ministry, (7) The author, (8) Adolph Baeumker, Chief Adviser to the Air Ministry In the background a Heinkel pursuit on hydroplanes floats

IF a foreigner is offered an opportunity to enter the secret domains of a present-day German aircraft factory and has to name his choice in a hurry he is apt to be torn between Junkers and Heinkel. Heinkel attracts him because of its famous high speed airplanes and seaplanes (or because it is well known that the Hemkel factory gates are the most difficult for a foreigner to "crash"), Junkers because it is a very great, very conservative aircraft factory where he will see 15,000 employees at work, but few radical designs. My choice was Heinkel

German aircraft factories of today cannot be judged by British or American standards, for under Hitler's new air expansion program, the functions of design and production have been divorced to a degree seldom, if ever, achieved in any other country at any time During the last war, both in England and in the United States, production contracts were let out to non-aeronautical factories for designs that were presumably standardized. But results were generally unsatisfactory Some of the output of such unregulated production showed alarming flight characteristics or loss of performance which, upon examination, could be traced to such minor oversights as unrouted spars or oversize fittings Another serious difficulty arose from constant changes in specifications coming in from the combat services Our own experience with the Dayton-Wright factory is a case in point. Although this plant could have turned out twelve airplanes a day for shipment overseas, each delivery that was made was followed by such a shower of change-orders that production was practically hamstrung And this on a well developed type with a year's service behind it

Small wonder, then, that separation of design and production has generally been looked upon with little favor in this country The Federal Aviation Commission said of the idea.

"The policy of maintaining on the one hand a number of experimental shops which will create new designs and develop new types of aircraft and take no further interest in their own handiwork after the first machine has been built and flown, and on the other hand a group of mass production plants that will take over the designs from the experimental units and build them in quantity, may seem a superficially attractive division of functions . . but no such relationship seems able to work on aircraft, as a consequence of the immense fluidity of the product and the necessity for keeping the design alive and flexible at every stage of production."

The German Air Ministry has, however, developed and put into operation a plan which apparently has overcome these objections Each factory is a highly specialized establishment The aeronautical companies that have been quietly building up and developing skilled design staffs during the years when production has been held close to zero by the Versailles treaty, are now in a position to turn out designs in a big way. Many of these factories maintained designing staffs outside of Germany proper, such as Dornier across Lake Constance in Switzerland, and Junkers in Sweden. Upon repudiation of the treaty these staffs were immediately brought back to their home factories, apparently according to a prearranged plan, bringing with them complete production programs The actual production of airplanes, on the other hand, is going into plants which, even up to a year ago, had nothing to do with aircraft, or into new factories which may be built, manned, and brought up to speed without waiting for the organization and training of an efficient aeronautical engineering staff

To avoid the pitfalls that have rendered such schemes inefficient in the past, three basic requirements have been set up, and must be rigidly adhered to In the first place, the designing company not only must carry through the engineering of any specific project, but must turn out one experimental airplane for service test. Furthermore, after all the changes required by the Services have been made on the test machine, it must then put through a trial production order for twelve units, including the working out and the building of all necessary tooling and jigs for a 100-unit order, making the necessary final compromises between performance requirements and production economies with the least possible sacrifice of aerodynamic efficiency. Once that has been accomplished, the production order may be farmed out under license agreement to almost any available factory (glass, metal or furniture plant). All jigs and drawings are shipped out to the production plant, accompanied by one supervising engineer to get the job properly under way.

Second control element in the production plan is the obvious one of basing government inspectors in each production plant to keep a constant check on the quality of all parts and assemblies Third, but not least important by far, is an absolute injunction against change orders of any kind within any production group once the original production example has been checked and approved.

Heinkel's "design factory"

Outstanding example of a "design factory" is the Heinkel plant at Warnemunde Dr. Heinkel's genius for radical departures in aerodynamics, structures and fabricating technique is well known here and abroad. Because of Heinkel's obvious importance in Germany's aviation picture today, Warnemunde is usually "out of bounds" for foreign technical and diplomatic visitors, so I was very much surprised and delighted, not only to receive a very gracious invitation to go there, but to have one of the Junkers Ju 52/3m planes (14 passenger, transport-bomber with 3 BMW Hornet engines) placed at our disposal for the trip The suggestion was made that I might like to try flying a *really good* airplane!

Departure was not from Berlin's commercial airport at Tempelhof, but from outlying Staaken Now Staaken is ordinarily a very difficult place to get into, for it is Air Ministry flight headquarters and, as such, corresponds roughly to our Washington Air Corps offices, Bolling Field, Wright Field and several other places all rolled into one Here ranking Air Ministry officials get in their flight time, and have opportunity to fly the latest military models But the gates flew open to our official cars and before us lay a nerve center of German Aviation—a field some four times as big as our Washington airport

Our Ju-52 was waiting for us Its three Hornets, although built in the Bavarian Motor Works under Pratt & Whitney license, had a familiar sound and "feel" as we taxied out and took-off

One of the latest experimental Junkers twin-engined bombers took-off just ahead of us It was a beautiful looking job of "advanced" design, well beyond the types to be found in quantity production in Germany, but it obviously needed controllable propellers if it were ever to be taken out of small fields Its retracting gear was tucked away before it cleared the hangars. The engines appeared to be the latest Mercedes Benz of 900 hp each The fuselage was very slim, which made the tail appear excessively long. Wings and fuselage appeared to be of smooth metal monocoque construction I would estimate that its speed would be in neighborhood of 235 m p h at 9,000 ft if the engines developed their full 1,800 hp at this altitude

Beside this model of perfection our Ju-52 seemed crude indeed. Its top speed at sea level is probably under 160 m.p.h Its exposed landing gear, corrugated surfaces and external Junkers type flaps and ailerons are not built for high speeds, but it is an interesting airplane in many other respects. Its flying qualities are excellent. Probably no other airplane in the world has had so many control surface changes or has undergone such painstaking flight research. Here the method, so admirably developed by Fokker, of getting excellent flying qualities "in the air" was carried on in great detail and was preceded by wind tunnel control tests as painstaking as those on the DC-2. The results obtained by Junkers on the Ju-52 (at the insistance and sponsorship of Luft Hansa) have been well worth while. Although its speed and comfort were inferior to American transports, its lightness of control was superior

I had flown a Ju-52 previously at Tempelhof on Luft Hansa's invitation, and had tried it out on the landing beam. I found to my amazement that the ship is spirally stable both with power off and on I tried out its behavior under all conditions that give trouble to some of our own airplanes—flight with one engine dead, landing with C G well forward, lateral control at stall, control with flaps full down, etc—and found that this almost obsolete old "tuh" is a real joy to fly—almost as light and responsive to the controls as some of our recent small military ships.

The airplane practically lands itself, something that may be said of some of our best smaller craft, but not of those of our larger ships—or England's either for that matter (C G G please note!). The Junkers flaps furnish the necessary high lift coupled with perfect control. In making the first landing I was a little nervous over the squashing pancake type of approach, and could hardly keep a restraining hand off the controls, but the lateral control was perfect all the way in The air was quite rough over the harbor and the ailerons were in constant use all the time I noticed that the ailerons were rigged without

droop I asked "why" and was told that "the pilots didn't like it!"

After the trip up to Warnemunde, the Junkers' pilot—obviously very proud of his ship's behavior—asked me, "Have you any very large airplanes in America as nice to fly?" And I had to admit somewhat ruefully that we did not. The chief reason, of course, is that no aircraft builder in America could afford to spend the time and money to make the number of changes put into the Ju-52 in a four-year period (40 odd modifications have been made on it in that time). Research has gone on long after the airplane was obsolete—the government pays the bills. The Junkers Company doesn't have to worry about selling the ships. They keep on turning them out as fast as their 15,000 employees can do so. The assumption that all German airplanes are as good as this because the German requirements specify such good flying qualities is, of course, taken with a grain of salt by those who remember the longitudinally unstable Dornier boats sold in 1930 to an American transport company. It was impossible to get an A.T.C. for them because they were dangerous to fly.

Experimental production

The Heinkel factory is not now in Warnemunde proper, but has been moved nearby to Rostock in Mecklenburg where a larger field and improved seaplane facilities are available. Rostock is also an important rail center. From the air one gets an impression of tremendous expansion in progress—new building foundations being dug, new factories going up, new hangars, new railway tracks being laid.

One huge factory building now houses six final assembly lines for the six "experimental production" orders now going through preparatory to licensing out to non-aeronautical factories. Over 600 engineers are at work on new designs and their adaptation to "outside" production under license.

Heinkel's wind tunnel research is done at Aachen University by a staff of twenty of their own aero-dynamacists. (Junkers aerodynamical work is done at the University of Gottingen on a similar basis.) Flight work on the preproduction experimental models is done at Rostock by Heinkel and D.V.L. pilots.

Most familiar of the six ships going through Heinkel's when I was there was the He-70A, which two years ago was the fastest transport or mail ship in the world, and is still probably the fastest for its power. In its commercial form it is being used on Luft Hansa's South American service between Berlin and Portugal. It was described in AVIATION for April, 1933. Wings are of wood—strongly reminiscent of our Lockheed Vega or Orion design except for a pronounced negative dihedral between the wing root and the point of attachment of the retracting landing gear—a sort of reversed "gull" effect. This obviously makes a difficult structural problem. Heinkel is reported to have tried out a straight wing, but buffeting was bad, and could not be cured by fillets, so they went back to the original, but more complicated pattern. Of interest also is one other experimental modification of the He-70 that turned out badly. Wishing to improve cabin space, the diameter of the fuselage was increased about 3 in. (7 cm.) but top speed dropped about 9 m.p.h. (14 km per hour) so that idea was also dropped.

Fuselage of the He-70 has an exceptionally smooth finish. It is flush rivetted throughout and it is practically impossible to detect any rivets or joints under the closest inspection. Flush riveting has been perfected to a very high degree in this airplane. It is said to be as economical as any ordinary type of rivetting, and it undoubedly gives better strength.

The landing gear retracts into the lower surface of the wing by swinging laterally outward. When retracted, all the under-wing surfaces are absolutely flush. The power plant is a BMW (Bayerische Motoren Werke) water-cooled V-12 of 630 hp.

Second most interestmg on Heinkel's production line was a twin-engined bomber very similar in appearance to the Douglas DC-2. It has two 900 hp engines supercharged to about 10,000 ft (3,000 meters). The span is shorter than the Douglas and the empennage smaller and closer coupled. These factors would probably militate against obtaining the same single-engined ceiling and take off characteristics of the DC2, but with its extra power and cleaner landing gear, it should be somewhat faster than the American ship.

Young idea

In detail, the bomber was far superior to anything of the sort I have seen in Europe, and illustrates better than any ship in Germany the creative genius of the younger generation of aeronautical engineers. Those younger groups, with their radical tendencies, may often turn out impossible or impractical designs, but every so often they will "ring the bell" that marks another great forward stride in the art. The older, more conservative groups, with their vast resources of experience, plod along, seldom making mistakes, but making progress by inches. Germany apparently realizes that to avoid "hardening of the arteries" of its aircraft industry it must give its younger designers a chance to show what they can do.

The other four types of the Heinkel assembly line were not as striking as the He-70 or the bomber. Number 3 was a single seat pursuit biplane of the type widely pictured in recent U. S. rotogravure sections showing the crack Richthofen Squadron at work. It is a very sturdy looking ship. Landing gear is of the single strut, wire-braced type. Engines are either liquid or air-cooled, inverted vees. Probably lower hp (250-300) may be fitted for training, with bigger engines (up to 600 hp.) for combat work. I saw one of them rigged as a seaplane on a pair of hydrolmium floats.

Number 4 ship was a seaplane trainer, a conventional looking machine, a single engined (240 hp. Argus modified vee, air-cooled) biplane mounted on a pair of wooden floats. Fifth was a rather special looking two-place biplane fitted with a British twin-row engine, intended for high altitude observation. Sixth was a dive bomber, a big two-bay biplane fitted with a Siemens radial air cooled engine, without cowling. I was told that it had been designed around a load factor of 16!

Bomb-proof factory

Returning from Warnemunde and Rostock we had a glimpse of the Henschel aircraft factory near Berlin. This plant is interesting on two counts; first, because it is the producing point for Dornier DO-F bombers, and second, because in its lay-out and construction, it illustrates the extreme "bomb consciousness" of modern Europe. Buildings are put up on a unit plan—widely spaced to minimize damage. Each has its gas-proof cellar for the employees, and every worker in the plant knows just what to do when gas or incendiary bombs begin to fall.

The DO-F is a twin-engined machine, a high wing monoplane, of only moderately good performance, but at Henschel's one gets the impression that they are being built "by the yard." It seems almost as though the wings are ground out in a continuous strip and then cut off every 30 yd. or so! The ship is frankly a second rater, referred to as a training bomber, and is probably about equivalent to our Keystone or Condor bombers still in service. Just as we might feel forced to turn out such obsolete types in an emergency, Germany is producing DO-F's because, for her, the emergency exists.

Herein is but another example of how Germany is now laboring to mend her fences. While much of the world is occupied in other quarters she is snatching the opportunity to rebuild her defenses. And to the average man in Germany today, they mean literally "defenses." Ask any thinking German whether the intention of Hitler's government is to force an aggressive war and the answer is invariably and sincerely "no." But he realizes at the same time that Germany's own security against attack lies in the potential striking power of her own bombers.

Mr. Allen will continue his discussion of current aeronautical developments in Germany in an early issue.

The W-1A as returned to Langley Field after modification by Fairchild at Hagerstown. The trailing edge glide control flap replaced the fixed leading-edge slotfall. Wings were also changed to accommodate NACA slot-lip ailerons.

The W-1A Airplane

The designer describes tests which led to the modification of the W-1, and discusses the possibilities of two-control operation.

By Fred E. Weick
National Advisory Committee for Aeronautics

ABOUT the time the original article on our W-1 appeared (AVIATION, July, 1934), the Department of Commerce, then getting its light-plane development program under way, requested the National Advisory Committee for Aeronautics to conduct a series of tests on the airplane. [Readers will recall that the W-1 was built by Mr. Weick and his associates as a private venture apart from any official connection with the NACA.—Ed.] These trials were intended primarily to obtain performance figures, and did not cover all of the special features of the design. When the ship was returned to us by the NACA, we made a complete investigation of its behavior, later modifying its design somewhat, particularly with respect to the wing and control surfaces. Herewith we pick up the story of the W-1 where we left it in 1934 and bring it up to date.

We had designed the original airplane to have satisfactory lateral stability and control throughout the entire speed and angle-of-attack range, power off or on, providing sufficient longitudinal stability and limiting the upward elevator travel to a point where the plane could not be held in a stall or forced into a spin. This limitation was not made during the NACA tests but was one of the first things done after the plane had been returned to us. The limitation as first tried was somewhat closer than previous tests had indicated was necessary (NACA Technical Report No. 418), and, as a result raised our minimum gliding speed 3 m.p.h. (35 to 38 m.p.h.) with only one person in the plane. With the stick held back to the limited position, the speed remained within 1 m.p.h. of the same value for all throttle settings, but the flight path varied from a steep glide with power off to a substantial climb at a very steep attitude with power full on. The plane could, with excess speed, be whipped into a momentary stall, but its inherent longitudinal stability would whip it out again into unstalled flight before any appreciable lateral motion could take place. The lateral stability was entirely satisfactory at the lowest speeds. The airplane was easily controlled by the ailerons (conventional form), although the adverse yawing moments substantially reduced their effectiveness.

With the limited elevator travel, satisfactory take offs were made merely by holding the stick full back and opening the throttle. The ground run was usually 200-250 ft., depending on the wind, as compared with 100-150 ft. for the unlimited elevator. The extra 100 ft. was usually not objectionable, but with an extremely soft field (which greatly increased the ground friction and made it more difficult to get the tail down and the wing angle up to a take-off attitude the run with the original control limitation sometimes was as much as 500 ft. For this reason, the control limitation was reduced somewhat and still found to be satisfactory.

By the time the plane climbed to 40 or 50 ft. it assumed an uncomfortably steep attitude, and we usually felt inclined to move the stick forward and change to a more normal position.

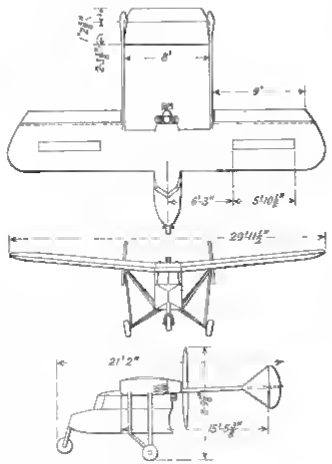
Landing trials

In designing the airplane we wanted (a) the widest possible range of gliding angles to facilitate approach, and (b) a stable, steerable, long-travel landing gear to take care of ground impact almost regardless of the manner in which contact was made. Tests and long experience have shown that the landing gear is quite satisfactory in the latter respect and that satisfactory landings can be made almost regardless of the wind direction or the manner in which the airplane is brought to the ground. The landing speed at contact has been varied from slightly below minimum flying speed in a pancake landing, to 75 m.p.h., some 40 m.p.h. above the minimum. In no case has any tendency to bounce or leave the ground after the original contact been noted. In a landing with side drift the stable castoring front wheel flicks the rudder bar slightly at contact and the airplane follows a path close to its direction of flight rather than its heading, no side force being noticeable at contact. No ground looping has occurred at any time, and the brakes have operated quite satisfactorily, even when fully applied before contact.

The shortest landing run (60 ft. in a 10 m.p.h. wind) was obtained by flaring suddenly and leveling off the flight path about 10 ft. above the ground, then sinking at a speed below the minimum steady gliding speed with brakes applied fully before contact. This type of landing makes use of an additional braking effect obtained by setting the airplane down hard with a vertical velocity in the neighborhood of 10 ft. per second. The wheels bear against the ground with a force two or three times the weight of the airplane for a short time, and the retarding force is greatly increased.

In practice, we made our landings in a lane spaced off by four flags. From the first we (R. C. Platt, who had soloed in the W-1 after eight hours of instruction in a conventional airplane—and I, who had done practically no flying for a period of ten years, and not a great deal before) found that we could land the airplane within a space 50 ft. wide and 300 ft. long with relative ease. After some practice the length of the landing strip was reduced by steps to 200 ft.

In September of 1934, after a summer of active flying, the engine failed suddenly and completely when the airplane was 150 or 200 ft. high, following take off from a small field. To land on the only clear spot of ground available, it was necessary to put the plane in its steepest glide with the stick full back, and finally to turn it and to hold it in a turn all the way down to the ground. With the high vertical velocity obtained in a turn with the stick full back (probably 25 or 30 ft. per second) and the extreme drift in a skidding turn (the wings were partially leveled just before contact), the landing gear was brushed off sidewise and some damage occurred to other parts of the plane, but none to the occupant.



Three views of the W-1A.

Modification to W-1A

We had originally planned to compare the landing of the airplane fitted with an auxiliary airfoil with that of the airplane fitted with a flap, and had therefore designed sufficient strength into the original wing to permit subsequent installation of a flap. Since considerable repair work was necessary after our forced landing we considered the time ripe to make the change.

The original auxiliary airfoil provided a wide range of glide angles, but an undesirable lag in changing the steepness of the glide was found to exist because a change in the flight path angle was accompanied by a change in speed. With a fixed wing arrangement the steepest glide is obtained at the lowest speed, and the flattest glide at a definitely higher speed. Thus in a landing approach, if the pilot desires to steepen his gliding angle he must change to a lower speed, which entails dissipating excess kinetic energy. This gives the plane a certain amount of extra lift, and makes it climb above the desired flight path for a moment instead of assuming the desired steeper glide at once. Also, if the plane is gliding steeply and the pilot desires to flatten his flight path, he must first nose the plane down to pick up the extra speed required, and considerable altitude is lost before the flight path is actually flattened. Thus, in order to maneuver the airplane to the desired landing place, the pilot must always be able to anticipate these delays in response, a requirement that may be difficult in maneuvering to land at a steep angle over an obstruction with the minimum possible clearance.

This weakness in the control of the gliding angle is found in all airplanes, particularly those with high-lift wings, and including those equipped with flaps as used to date. The best solution has apparently been obtained by the use of air brakes giving drag only, such as strut fairings that can be turned broadside to the air flow, but such devices give but a relatively small increase in drag and have relatively little effect on the steepness of glide path of an airplane with high lift wings especially when it is traveling slowly.

Previous experience with the W-1 led to the belief that substantial improvement in landing approach would be obtained if the airplane were fitted with a high lift device (say a flap) having low drag and therefore permitting a relatively flat glide at low speed. Approaching a field, the high lift flap would be deflected by means of a lever with a ratchet to hold it in place. The stability of the airplane would be made such that it would balance with no force on the control stick at a few m.p.h. above the minimum speed. The plane would also be equipped with an air brake to greatly increase the drag, and therefore the gliding angle, without increasing the lift or disturbing the balance. Applying the air brake, the steepness of its glide path would be increased, the speed and angle of attack remaining essentially the same and the nose of the plane being depressed the same amount as the flight path. If the brake were released, the nose would immediately rise and the flight path would be flattened out again, still at the same speed. The response should be immediate in both cases because no appreciable change of speed or kinetic energy is involved. As the landing spot is approached, the glide path could be instantaneously regulated at all times to take care of initial errors in judgment or changing wind conditions. The airplane would have at all times sufficient reserve speed and energy to overcome the effects of gusts and to permit it to flare and level off before contact.

We decided to fit the W-1 with a specially designed wing flap incorporating both the high lift device and the air brake. This flap was calculated to give a high lift and a relatively low drag when deflected only slightly—about 20 degrees. Further deflection would increase its drag while still maintaining the same or a slightly higher maximum lift coefficient. The first, or high lift, part of the flap deflection would be effected by means of a ratchet lever that would stay in place until deliberately released. The second, or braking, part of the deflection could be obtained by pulling the same lever further, but this portion of the travel would have no ratchets so that the brake would have to be held on.

There was no room for the flap in the space between the booms in front of the propeller, so it was necessary to install it in the space originally taken by the ailerons. The original ailerons were therefore replaced with a slot-lip type recently developed at the NACA laboratories. (See sketch.) With these ailerons the adverse yawing moments are eliminated, and they therefore provide a better lateral control for two-control operation, which we had also originally planned to try.

At this stage of the development the Bureau of Air Commerce agreed, as part of its development program, to purchase the airplane with these modifications, the modifications and repairs to be made by an established aircraft company. Arrangements were made to have the work done by the Kreider-Reisner Division of the Fairchild Aircraft Corporation. When completed, the plane, now the W-1A, was again officially tested by the NACA at the request of the Bureau of Air Commerce. After the completion of the tests, the Bureau kindly gave us an opportunity to fly it for a sufficient time to compare the flap with the auxiliary airfoil and also to try out the two-control operation.

Glide-control flap

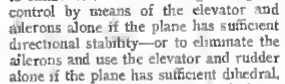
In the flap installation of the W-1A an attempt was made to incorporate all the desired features by modifying the original wing section without changing the main structure. This was successful to the extent that the principle of the type of landing described above could be given a fair trial, but the installation was imperfect in many respects. The wing had too high a drag and too low a maximum lift. Also, perfect trim for balance at a single speed with all flap deflections for the landing condition was not quite obtained by the crude bungee device that was considered satisfactory by the NACA staff for the purpose of their tests. These disadvantages are associated with this particular experimental airplane, however, and need not be present at all in a new design incorporating the glide-control flap.

We found that simultaneous operation of both the flap lever and the control stick seemed rather cumbersome for the first few trials, but became easy and natural after a few landings. After a large number of trials we concluded that maneuvering the airplane to land at a given spot was decidedly easier, more direct, and more satisfactory in the W-1A with glide-control flap than in the original W-1 with the auxiliary airfoil.

Two-control operation

We originally designed the W-1 with the hope of giving two-control operation a sufficiently fair and thorough trial to settle the question of practicability and desirability in the field of private flying. We felt that the elimination of one of the three air controls (longitudinal, directional, and lateral) would almost certainly improve the airplane for general private flying if no compensating disadvantages were incurred.

Previous NACA flight tests (NACA Technical Report No. 494) had shown that as far as handling an airplane in the air is concerned, it is quite feasible to eliminate the rudder and get adequate control by means of the elevator and ailerons alone if the plane has sufficient directional stability—or to eliminate the ailerons and use the elevator and rudder alone if the plane has sufficient dihedral. All three controls are required, however, to land a normal airplane in a cross-wind because of the instability of the normal type landing gear. Also, with the limited range of gliding angles of normal airplanes, and the limited field of view for the pilot, it is often desirable to sideslip, a maneuver requiring three controls.



Wing section of the W-1A showing the NACA slot-lip aileron and the glide control flap.

My first attempts at two-control flight were made by simply taking my feet off the rudder bar and using the slot-lip ailerons as the sole means of lateral control. After some turns in the air I tried making straight up-wind landings in the 50x300-ft. strip. The flap was used to control the glide angle. These landings seemed satisfactory, so I tried jogging in by making an approach to one side and an S turn just before contact. This also seemed satisfactory and I then tried landing by throttling the engine at an altitude of 400 ft. and making 180 deg. turns to the landing strip. These gave no particular difficulty so I tried all types with the landing strip cross-wind—also without difficulty.

I then tried using rudder and elevators only, holding the ailerons in neutral. I found it easy to make reasonably satisfactory turns in the air but difficult near the ground where the airplane skidded noticeably in entering a turn, and slipped downward noticeably when starting to recover. It seemed to wallow around considerably in the turns to a landing at a particular spot. In these trials I could not prevent myself from using the ailerons occasionally to pick up a wing, rather than wait for the effect of the rudder.

I had done this before Mr. Platt started flying the plane in its modified form. With the idea that I had not given the rudder a fair test because I had become accustomed to the ailerons first, I had him try the rudder alone first. After he had made a few flights with all three controls to familiarize himself with the plane, the ailerons were locked in neutral and he put in two hours landing in the 50x300-ft. strip. He had the same difficulty I had had in skewing around considerably when making landings from turns. I then tried it again, this time with the ailerons locked, but the results were no better. We both found that straight landings could be made satisfactorily either up-wind or cross-wind but when we attempted curved approaches to the strip we wallowed around alarmingly and gave the landing gear an opportunity to prove its worth.

We then locked the rudders and tried the ailerons as the sole lateral and directional control. The cables were removed from the rudder bar so that it was used to steer the front wheel only. We found that turns were made with less slipping with the rudder locked than with the rudder free. The entrance to turns was made with no substantial slipping or skidding, the steady portion of the turn was always accompanied by a slight inward slip and the recovery seemed quite satisfactory. Both of us agreed that the control was decidedly better with the ailerons alone than with the rudder alone. We made turns and recoveries, and up-wind, cross-wind, and down-wind landings with straight, S, and 180 deg. turn approaches, all with ease and apparently as well as with all three controls.

We then tried a wheel control in place of the stick, the front landing gear wheel still being steered by means of the rudder bar. We decided that we liked the wheel at least as well as the stick, if not slightly better. The wheel control would make a very satisfactory arrangement if it were connected to steer the front wheel also.

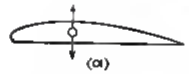
For the W-1A with its stable landing gear, two-control operation, using the elevators and slot-lip ailerons, is quite satisfactory and sufficient for ordinary flying.

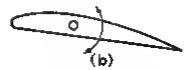
The austere mathematical treatment to which wing flutter has been subjected in recent years does not, so far, appear to have brought much enlightenment to the practical designer. For him, the author re-emphasizes the simplicity of the physical principles involved in the problem. The first of several articles.

Flutter

By Manfred Rauscher

Assistant Professor of Aerodynamics
Massachusetts Institute of Technology





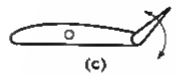


Fig. 1

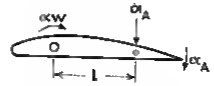


Fig. 4

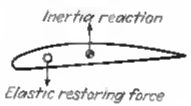


Fig. 6

THE motion of a wing relative to the rest of the airplane can ordinarily be resolved into three components corresponding, respectively, to *flexure* of the elastic axis, to *torsion* about the elastic axis, and to *displacements of the control surfaces*. The *elastic axis* may be defined either as the line which does not deflect under pure torsion of the wing, or as the line on which loads must be applied to produce pure flexure.

This resolution fails when torsion and flexure are inseparable, as on swept-back wings, or when a torsional or flexural motion also involves a fore-and-aft one, as on wings with certain types of external bracing. But while some of these special cases may call for a special approach, it is possible in others to find the rough equivalent of an elastic axis, and to continue to regard the resultant motion as the simple sum of three elementary motions. This possibility is presumed in all the following discussions.

Flutter develops when any of the elementary motions become unstable—i.e., disposed to grow if started. To secure stability, it is necessary to have *stiffness*, tending to return the moving parts to their initial position, and *damping*, or dissipation of the energy of motion. Negative stiffness leads to a straight *divergence* from the equilibrium position, to so-called "static" instability; negative damping produces *unstable oscillations*, or what may be called "dynamic" instability.

The control surfaces have static stability about their hinges unless they are overbalanced aerodynamically, and their motions are always damped. Flexural displacements are always opposed by the stiffness of the structure, and they are damped so long as the slope of the lift curve is positive, i.e., at all angles of attack below the stall. Torsional displacements are also opposed by the stiffness of the structure but may be aided by a negative "aerodynamic stiffness," i.e., by an aerodynamic upsetting moment which increases with the twist. A torsional divergence is thus possible. The damping of torsional oscillations, though perhaps negative under certain conditions, especially at a low Reynolds Number (Frazer and Duncan, "The Flutter of Aeroplane Wings," R&M 1155, 1928) is generally positive and will be assumed so in these articles (Fig. 1, *a*, *b*, *c*).

With the exception of the torsional divergence, which is not really a fluttering motion and which will therefore be considered separately later, all of the elementary motions individually, are thus stable under ordinary conditions. This does not mean, however, that the motions will remain stable if combined. In flutter of the composite type the effects of any one of the component motions may be detrimental to the stability of the other components, and all the components may then become unstable through each other's interference. Whether the stabilizing or the upsetting forces prevail in any given case depends on the structural and aerodynamic features of the wing, and on the distribution of its mass.

The general "ternary" type of flutter, in which the wing exercises its full freedom (three degrees) is hard to treat without mathematics. But a composite picture of ternary flutter may be obtained by considering the three types of "binary" flutter, in each of which only two of the elementary vibrations are involved. (Fig. 2, 3, 5.) Since actual flutter is often of an essentially binary type, with one of the components of the motion largely overshadowed by the other two, the study of binary flutter is also of considerable interest in itself—and actually of greater practical importance than that of ternary flutter.

Because the fuselage partakes to a certain extent in the fluttering motions, and because of the continuity of the spars and control lines, it is necessary to keep in view the whole wing, rather than just a half-wing. Theory indicates that wing flutter is either "symmetrical" (wing tips moving in phase) or "antisymmetrical" (wing tips moving 180 deg. out of phase) if the right and left sides of the wing are exactly alike. The "critical speeds" (speeds at which flutter begins) are generally different for the two types of motion. Experimentally it has been found that symmetry or antisymmetry tends to be maintained even when there are slight differences between the two halves of the wing—but if the difference between the half-wings is marked, the motions of the two sides become quite independent of each other, with different frequencies and steadily changing phase relations, and typical beats. A more or less jerky shifting back and forth between periods of symmetrical and of antisymmetrical motion as sometimes observed in flexural-torsional flutter, may correspond to a case where the symmetry of the wing is just on the borderline between "slight" and "marked." In practice, this borderline appears unlikely to be transcended without deliberate effort, and no important points will thus be missed by limiting the following discussions to flutter of a definitely symmetrical or antisymmetrical type.

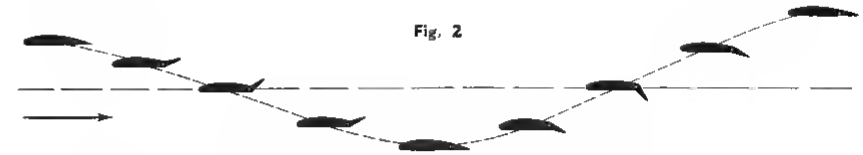


Fig. 2

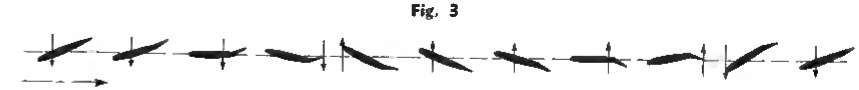


Fig. 3

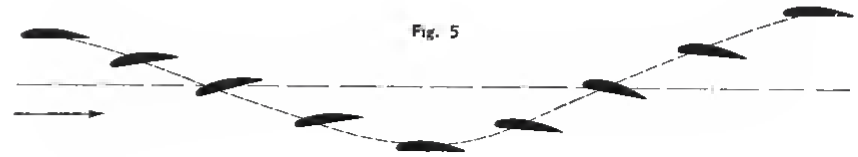


Fig. 5

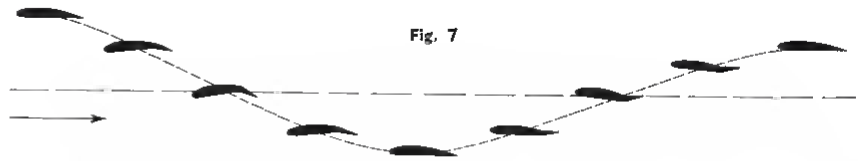


Fig. 7

Flexural-aileron flutter

Flexural-aileron flutter involves a flexural motion of the wing coupled with a flapping of the ailerons about their hinges, as shown in Fig. 2. It may be taken to represent the flutter of a wing that is very stiff in torsion.

The obvious remedy for this kind of flutter lies in suppressing the motion of the ailerons—i.e., in reducing the flutter to the type of Fig. 1*a*. If the flutter is *symmetrical* the freedom of the aileron depends on the backlash and the strain of the control system. The stiffer and tighter the system is, the more difficult it becomes for flutter to develop. In *antisymmetrical* flutter the ailerons are restrained only by the pilot's hold of the controls, which is non-rigid at best, and is usually lost altogether as soon as flutter sets in. With tight controls one would, as a rule, expect flexural-aileron flutter to develop in the antisymmetrical form, and numerous reports of pilots' wrists and knees injured by stick movements accompanying flutter show this expectation to be well founded. Even in those cases where symmetrical flutter does develop, it is probable that a tightening of the control system, by raising the critical speed of the symmetrical motion, will finally change the flutter to the antisymmetrical form. It may thus be concluded that even the most carefully maintained control system will allow the ailerons to participate in the flutter sooner or later.

A definite stop can be put to the flapping of the ailerons either by clamping the ailerons rigidly to the wing in whatever position the pilot may momentarily set them, or by balancing them so that they no longer tend to turn under accelerations of their hinges. Of these expedients the first is more or less ruled out by its delicate relation to the freedom of normal operation of the controls. The remedy for flexural-aileron flutter lies, therefore, principally in mass-balancing the ailerons.

Torsional-aileron flutter

If a wing is very stiff in flexure and relatively soft in torsion, a twisting of the wing, combined with a flapping of the ailerons, may become the predominating feature of its flutter. Flutter of this "torsional-aileron" type would be most likely to occur with externally braced single-spar wings carrying ailerons or flaps, or with conventional wings supported by external bracing at a single point.

Torsional-aileron flutter may be explained roughly as in Fig. 3. The remedy lies again in making the ailerons move as solid parts of the wing—either by clamping them in position, or by mass-balancing. The balancing, in this case, must be carried to the point of over-balance, so as to produce the couples necessary to make the aileron turn with the wing. The amount of over-balancing required can be estimated as follows:

Let the wing with its aileron be dis-

placed momentarily through a small angle θ from the position of static equilibrium Let α_w be the angular acceleration of the wing, l the distance from the elastic axis to the aileron hinge, α_A the angular acceleration of the aileron about its hinge; Q_A the statical moment, and I_A the mass moment of inertia of the aileron about the hinge. Then (Fig 4) the moment acting on the aileron will be

$$M_A = a_A Q_A = l\,\alpha_w Q_A = I_A \alpha_A,$$

and for $\alpha_A = \alpha_w$, it is necessary that

$$Q_A = I_A/l$$

Flexural-torsional flutter

Flexural torsional flutter broadly resembles flexural-aileron flutter But instead of the flapping of the ailerons there is now a torsional motion of the wing itself about the elastic axis (Fig 5)—the wing twisting under the moment exerted on it by the flexural restoring force, which acts as the elastic axis, and the equal and opposite force, acting at the C.G of the wing section. (Fig 6)

Flexural-torsional flutter is what remains of ternary flutter after the ailerons have been clamped to the wing, or have been balanced so that they move as a solid portion of the wing To cure this type of flutter completely, the C.G. at every section of the wing would have to be brought to the elastic axis (from a normal location at 40 or 45 per cent of the chord to one around 30-35 per cent The severity of this requirement discourages any thoughts of meeting it. Consequently, a stiffening of the wing structure, especially in torsion, is all that is usually attempted to guard against the occurrence of flexural-torsional flutter with the hope that the critical speed may thus be pushed beyond the limiting speed, or highest operating speed, of the airplane. A more complete remedy, however, lies in providing an overbalance of the ailerons slightly in excess of that required to make the ailerons move as part of the wing The ailerons will then act beneficially under accelerations, so as to hinder the flexural motion, and hence to counteract the influence of the twisting of the wing

Ternary flutter

Since the ternary flutter may always be reduced to an essentially binary form by a proper balancing of the ailerons, and since such a balancing will always be the logical first step toward the prevention or cure of flutter, there is little practical interest in discussing ternary flutter in its general aspects. The only type of ternary motion considered here will thus be the stable one mentioned in the preceding paragraph, and shown in Fig 7

The figure has been drawn on the assumption that the hinge line of the aileron is always accelerated in the same direction as the elastic axis, in spite of the torsional yielding of the

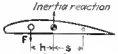


Fig. 8

wing That this assumption is justified in the typical case may be seen by considering the beginning of the motion in somewhat more detail (Fig 8) Thus, after a momentary disturbance has deflected the wing slightly from its position of static equilibrium, let there be acting an unbalanced flexural restoring force F. This force acts at the elastic axis and may be replaced by a similar force at the C.G. and a couple Fh where h denotes the distance from the elastic axis to the C G Now, let m be the mass of the wing a_0 the acceleration of the C G ; I_0 the moment of inertia of the wing about an axis through the C G α_w the angular acceleration of the wing; s the distance from the C.G. to the aileron hinge, a_1 the acceleration of the aileron hinge Then

$$m a_0 = F \quad \alpha_w I_0 = F h \quad \alpha_w = Fh/I_0 = a_0 \frac{mh}{I_0},$$

$$a_1 = a_0 - s\alpha_w = a_0 \left\{ 1 - \frac{hsm}{I_0} \right\}$$

Typical values for h, s, I_0 in terms of the wing chord c

$$h = c/8, s = 3c/8, I_0 = \left(\frac{c}{4}\right)^2 m = c^2 m/16$$

Hence

$$a_1 = a_0 \left\{ 1 - \frac{48 mc^2}{64 mc^2} \right\}$$
$$= 0\,25\, a_0, \text{ approximately}$$

This is at the first instant of the return motion, before the wing has had a chance to twist and to absorb part of the torque Fh by its elasticity As the motion progresses the wing does distort a decreasing fraction of Fh is left to produce torsional acceleration, and a_1 becomes more and more nearly equal to a_0. Thus, even if the constants of a particular wing should be such as to make a_1 negative at the first instant, a_1 is likely to become positive before the motion has progressed very far in its cycle, and the effectiveness of overbalancing the ailerons is assured if only the ratio a_1/a_0 is predominantly positive through the cycle—as, in fact, it can generally be counted on to be. The over-balance actually wanted is of the order of that suggested for the suppression of torsional-aileron flutter. More specifically, it should be at least such that from the first instant of the motion considered above, the aileron deflection offsets the loss of lift resulting from wing twist—i e., the ratio between the initial angular accelerations α_A and α_W should be such that

$$\alpha_A \frac{dL}{d\beta} = \alpha_w \frac{dL}{d\theta}$$

if $dL/d\beta$ is the rate of change of the lift with respect to the aileron angle, and $dL/d\theta$ the rate of change with respect to the angle of twist of the wing

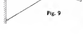


Fig. 9

Externally-braced wings

On a wing or tail with external bracing flutter is constrained between nodes at the points of support Whether these points may actually be regarded as fixed, and therefore as true nodes, or whether they are capable of substantial movements of their own, depends on the type of bracing (by struts or by wires)

Except for the shape of the flexural curves of the spars, the flutter about a fixed node is generally similar to free cantilever flutter Balancing of the ailerons and torsional stiffening of the wing panels are the preventive measures as before As a detail, it is to be observed that the portion of the ailerons inboard and outboard of the strut points being always accelerated in opposite directions now counteract each others' tendency to turn (Fig 9). With the large overhangs that commonly go with rigid bracing, the ailerons lie almost entirely outboard of the strut points Since the amplitude of the motion is greater toward the tips than in the bays, the actual balancing effect of the inboard portion of the ailerons is likely to be small But the effective unbalance can at least be reduced by an extension of the ailerons inward from the strut points, and in principle it could be eliminated altogether if the length of the bays were sufficiently large compared to that of the tips Only what has been called "overbalance" is not attainable in this way Overbalance, as applied to cover braced wings, would cause aileron displacements opposed to the flutter in the section (inboard or outboard) in which such opposition would have a controlling influence on the whole motion Since this section is bound to be the one in which the ailerons themselves experience the principal reactions, an aileron portion lying in another section can never bring about a beneficial net aileron effect. As a matter of fact, even a straight balance could not be attained because the ailerons twist somewhat under the opposing inertia couples on the two sides of a node.

Professor Rauscher will continue his discussion of flutter in an early issue

Ben King light plane record breaker, and S A.E's Underwood confer on a timing problem

Winding up G H.Q. maneuvers the Air Corps did its stuff for air race crowds.

Right: Walt Hamilton of TWA, chairman of the Maintenance Committee takes time out between sessions for a little nourishment.

Reilly

Race crowds gaped at the Army's "Trapeze Team," guffawed at the antics of the "Three Mugs of Brew"

Left: Col. Harold Hartney represented the Copeland Senate Committee at Air Transport maintenance meetings.

Reilly

Reilly

Miami Meetings

Air Corps maneuvers, air transport maintenance meetings, air races, Dec. 8 to 14.

(See News Section)

Reilly

A Canadian visitor to the maintenance meetings, Peter P. Brenon of the Department of Lands and Forests.

Left: Maintenance meetings were not all beer and skittles, but lunches on the Hotel Poinciana beach involved pleasant interludes in the three-day sessions

Reilly

Going Places

By Roy U. St. John
Manager, San Francisco Bay Airdrome

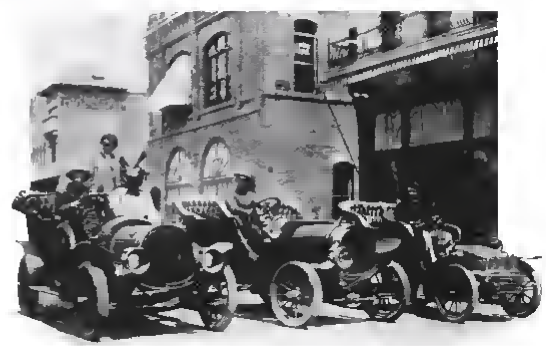
One week end we visited Lake Tahoe. There were a half dozen ships and the local residents came out to visit with us.

1899 "At a turn in the road our horse took fright at the sight of a detachment of the American Wheelmen clad in fancy caps and blazers, pedalling furiously. They must have been making all of 5 or 6 miles an hour. Later we heard that they had finished a century run in the amazing time of fifteen hours, eight minutes."

1905 "Six cars of the Oscaloosa Motor Club toured to Forest Rock last Sunday where a picnic lunch was prepared and enjoyed by all. On the way home, Wilbur Jones and Ed. Smith had punctured tires and Taylor's new Rambler overheated and stopped several times, but everyone lent a hand and the motor cars were seen in running condition again. The hundred mile round-trip was made in nine hours."

1935 "Fifteen planes from San Francisco Bay Airdrome, toured to Lake Tahoe in the Sierras last week end. While there the party enjoyed golf, fishing, and horseback riding. The 300-mile trip was completed in two hours, 50 minutes."

Like the bicycle Century Runs of the gay Nineties, or the Auto Club trips of the early nineteen-hundreds, informal airplane tours furnish fun for participants, benefit airport operators and manufacturers. Primary requirements of a successful air tour: brevity and an interesting objective.



THE practice of visiting places of interest in small groups has always been highly beneficial to the manufacturers of private transportation equipment and we have developed it with some success in our operations at San Francisco Bay Airdrome. But there is a decided difference between the tours we conduct and the highly organized and widely publicized affairs of an earlier period of aviation history.

Most of the early tours were very elaborate, often lasting for a week or more and taking the participants from one end of the country to the other. By and large, they were more work than fun. There were strict rules to be observed, complicated formulas to be worked out. After the first day or so, the early morning start with three or four hours of flying before and after lunch and the inevitable formal banquet at night, became irksome. Long before the homegoing, the planes were streaked with oil and the pilots had black circles under their eyes. They were doubtless worth the effort, however, because they served notice on the whole country that a new means of transportation was at hand.

As a direct result, a considerable number of people learned to fly and bought their own planes. The first few cross-country flights were events for the new owner. It was gratifying to lay out a course on the map and watch the country unfold as the compass pointed the way. But soon the novelty of being able to fly from place to place without getting lost wore off, and too many of the planes were left to gather dust in the hangar. People simply had no place to go.

Being engaged in the airport business the sight of so many privately owned planes lying idle bothered us considerably, so, for a suggestion, we looked back at the period of bicycle and the automobile history when groups of owners pedaled or honked their way from the city to the country every week-end in search of recreation.

About three years ago the idea that something should be done to make flying more interesting for the private owner resolved itself into a program which has been carried out more or less faithfully ever since. Our funds were somewhat limited, and the program had to be based not so much on what should be done, but on what could be done without any too great expense. Our initial objective was to point out to the airplane owner that there were many places that could be reached by plane which would afford not only an interesting flight but something to do after he got there.

The first thing to be done was to acquire as much information as possible about other airports, particularly those which served accessible recreational areas. The basis of this information was readily found in the various private and government Airport Guides. These lists are being constantly revised, and nearly all revisions are published in the "Weekly Notice to Airmen" which is prepared by the Bureau of Air Commerce and available upon request. By making marginal notations of changes, and by keeping a complete file of the notices it is possible to furnish accurate, up to date information concerning the status of nearby airports.

This "book information" about airports is supplemented as much as possible by personal flights to other airports, and by questioning pilots who have just visited some airport about which little is known. Information concerning transportation facilities between the airport and the town is particularly useful; it helps a lot to know that "Bill Jones" is always at the field when a plane lands and will run the pilots into town without delay.

Some debunking needed

There is a tendency on the part of some pilots to make their flying feats sound more interesting by exaggerating the hazards that they have encountered at the smaller airports. It is certain that many good private pilots, who are thoroughly competent to land on any airport, have been deterred from visiting out of the way places because they have listened to a colorful tale of terrific side slips and screaming brakes. Most of the time such things exist only in the imagination of the person spinning the yarn.

It has been gratifying to us during the past three years to be able to provide a good many pilots with accurate information concerning airports which they intended to visit. This service has cost nothing in money and very little effort. It has helped to encourage some private owners to extend their flying to more distant pastures where the grass always seems greener.

The second phase of our program is to issue a mimeographed bulletin listing such events as rodeos, fiestas, ball games, and air meets in which the sportsman pilot might be interested. The name of the nearest airport and its distance from the place where the event is to be held is always included. During the hunting and fishing season considerable space is devoted to tying in the hunting and fishing country with the airports which are best situated to serve the flying sportsman. These bulletins have been issued at irregular intervals approximately a month apart. They are mailed to a list which includes all airports in the immediate vicinity as well as about 100 airplane owners.

The tour idea

The third and most interesting phase is to promote and encourage air tours of all kinds to induce airplane owners to use their planes to go places instead of considering them just something with which to impress their friends. With this in mind, most of our tours have been simple week-end trips to some interesting point where there was something to do at the end of the flight. There has been no attempt to get in a lot of flying or have a large delegation of citizens at each stop to welcome the intrepid airmen. In fact we avoid this sort of thing. The principal effort has been to provide both the fliers and the citizens with a good time.

A principal requisite for a successful

tour is to find some local man at the destination who is an aviation enthusiast and who will take the responsibility for arranging the details of transportation, hotel accommodations, and entertainment. The members of the party pay their own expenses, of course, just as they would if they went on a week-end trip by automobile, but the local enthusiast sees to it that there is no overcharging at hotels or for local transportation and (usually through the cooperation of service clubs and chambers of commerce) makes sure that the visitors see all the points of interest and have a chance to enjoy whatever sports and pastimes are available.

Naturally most of the trips have been into the recreation areas of the state which cater to vacationists. At such places the preliminary arrangements are usually quite simple. Resort owners have been more than willing to quote special rates and to arrange the transportation between the airport and hotel.

Week-end at Sonora

One very enjoyable week-end flight was to Sonora, a city whose history goes back to the "days of '49' when gold was discovered in California. The party took to the air about 2 p.m. on Saturday and arrived at the new Ralph Field, Sonora, an hour later. That evening a large group of local people joined with the fliers for a dinner featured by the absence of any oratory. After dinner some attended an entertainment at the high school, while others preferred to go to a dance in a neighboring town.

The next morning through the courtesy of the Lion's Club, automobiles were provided and the visitors were first taken to see the old town of Columbia, one of the most interesting places in early California history. After Columbia, a trip was made to one of the modern gold mines, where the stamp mill and underground workings were inspected. Back to Sonora for lunch and then most everyone went down to the river for a swim before starting for home.

Wawona and Yosemite

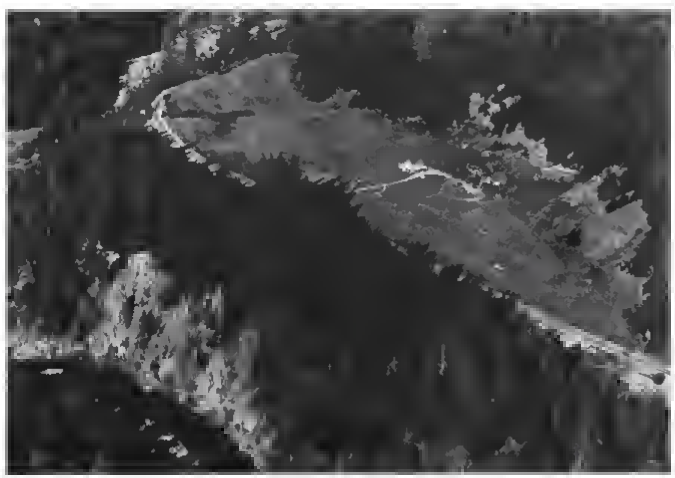
Another trip which stands out, was to Yosemite Valley. The nearest airport, at that time was Merced, 80 miles away. Large buses were at the field when the planes landed and in a couple of hours the fliers were enjoying the wonders of Yosemite. One object in making this flight was to encourage the building of a projected airport at Wawona, which is in Yosemite National Park and only about a half-hour drive from the Valley. A year later the Wawona field was available for restricted use and a second trip was made to Yosemite. This time the party stayed at Wawona (where excellent hotel accommodations are available), played golf, fished, rode horseback and still had time for half a day's sightseeing in the Valley itself.

These tours are typical of all that have been planned. They appeal to the private owners because they provide a week-end outing in which the transportation and other small problems have been arranged for them, and the cost is not excessive. The local people like to have these visitors come, because it brings activity to their airport and gives them a chance to show the beauties of their locality to the "city folks." One private owner was so impressed with the surroundings at a certain point visited on a tour, that he purchased a lot, built a summer home and has been a regular week-end commuter ever since.

During 1934 five tours were arranged. An average of seven planes and sixteen people participated in each. So far, in 1935, seven trips have been carried out, with the participation averaging nine planes and 21 persons. None of the tours have had more than fifteen planes and one had only three. Each has provided a week end in which flying was combined with other forms of recreation. One of the major pleasures is to look down from a comfortable position in the uncrowded airways and watch the week-end motorists moving along at a snail's pace on congested highways and getting nowhere fast.

Let automobiles gather dust

The results of our three-year programs have not been sensational, but they have been sufficiently encouraging to justify the continuance of the effort. The sight of privately owned airplanes lying idle, while their owners play golf or make long week-end trips by automobile instead of flying is a challenge to everyone engaged in commercial aviation. Someday, perhaps it will be the automobile that is gathering the dust and the airplane will be carrying its owner hither and yon for business and for pleasure.



Destination: An airport where flyers may fish

By
John H. Shobe
President, Shobe Airlines, Inc.;
Member, Stinson Air Cab Operators

Next Year's Business

Charter operators cannot build business by competing with scheduled air and rail services, but there is a fertile field for supplementary, emergency, and feeder services in cooperation with existing facilities.

A WELL-DRESSED college student burst into our Boston airport office one morning and breathlessly announced that he wanted to charter a plane to Asheville, N. C.

"An emergency case?" he was asked by one of our staff.

"If you care to call it that," he replied, "I just discovered that I must report to a class at 8:30 o'clock tomorrow morning."

We checked up on the charter rate to Asheville but we also looked up the scheduled transportation facilities between the two points and discovered the flight would be a luxury for the young man. Finally we obtained a seat for him on American Airlines to Washington and a rail reservation from there to his destination. We transferred his bags to the airline terminal, and, as he boarded the Condor, he was still thanking us for the $200 we had saved him.

By this time you probably have concluded that we are eligible for admission to the nearest psychopathic institution. Or you have decided that we are traitors to our particular branch of the aviation business. But if this be treason, make the most of it. We want to go on eating regularly next year and the years after that. Too many people in this and other businesses are concentrating on today's revenue. And when tomorrow comes and brings along the sheriff, they cannot understand why. But they have not been willing to face the facts of their business.

We might just as well be realistic in considering the problem of our relations with the scheduled airlines and other transportation systems. No business can be founded on the practice of paralleling regular services and charging three to six times the established price. If charter planes are to operate along the airlines, they must supplement and not conflict with the regular airline schedules. They belong more properly in the category of emergency feeder services.

But turning down business at times is not the only unpleasant job about running a flying service. There are many

others And one of the most important is keeping down overhead.

Hand carved mahogany desks in spacious offices carpeted with deep-pile oriental rugs provide the proper setting for the dispensers of the mysteries of astrology (a $125,000,000 industry) but they have no proper place in flying service operation We provide a comfortable, neatly furnished sitting room for our passengers but we try to have them spend as little time in it as possible Every minute a passenger is required to wait for a charter plane is a reflection against the operator. In a recent case we picked up a couple from an arriving airliner and transferred them and their baggage to one of our Stinsons in a total elapsed time of three minutes Telegraphic reservation of the ship had been made from the previous airline stop.

Any hour, night or day

The chief selling point of our charter service lies in the fact that our planes and pilots are ready to go at any hour, night or day. Incidentally, our rates are the same for night or day flying and we make no extra charge for flying over unlighted airways. Each night when the ships are put in the hangar, they are completely serviced by our line crew and made ready for flight. We go to bed with the assurance that, if the telephone calls us out in the middle of the night, each ship is filled to capacity with gas and all night flying equipment is in good order and the radio is functioning perfectly Our pilots live within ten minutes of the airport and we can be ready for take-off fifteen minutes after we are called

A great deal of midnight flying is done between Boston and New York, during the hours when the airline service is not available During the past year we have had a few ambulance cases. One originated in Charlottetown, Prince Edward Island This came in the dead of winter and we worked all night preparing skis for one of the Stinsons. One of the forward seats was removed and we rigged up an improvised bed for our sick passenger who made a comfortable journey in five hours flying time.

The advent of horse racing has brought up considerable business in this section. Witness the periodic charter flyer who looks over the field at Suffolk Downs, leaves instructions on his bets for the day and then flies with us to Springfield to place bets at the Agawam track He remains at Agawam until the last race and then listens to the Suffolk Downs results on our radio on the way back to Boston

Our association with other charter operators throughout New England is very pleasant We have reached a favorable rate level and if there is any price-cutting, we are not aware of it. Special attention is showered upon each potential customer Most of our contacts come by telephone and we make it a point to answer any and all questions about our service, no matter how ridiculous the request may be.

We carry a wealth of interesting characters to and fro during the course of each week and we have grown to recognize the types of people who charter airplanes On prices we make no discrimination Twenty cents a mile is generally offered Some of our customers prefer to pay by the hour. Each ship is equipped with a service-recording device which accurately marks on a chart the exact number of minutes the plane is flown. Our ships have been used by the great and humble alike We carried the late Will Rogers to New York from Boston on what turned out to be his last New England visit Eugene L. Vidal, the Director of Air Commerce, Col. Roscoe Turner, high government officials, social leaders, actors, actresses, professional men, traveling salesmen, race track fans, college boys, lovers, sailors, clerks and business leaders have all been carried by our ships

We have virtually dedicated our service to charter flying, the bulk of our business being in this category. So many of our customers have displayed interest in learning to fly that we have been operating an Aeronca most successfully for more than a year. We also use one of the Stinsons for advance instruction work. Aerial photography is another field that is unlimited in possibilities. We have yet to tap this market, but have acquired an aerial camera which is carried as standard equipment on charter on clear days

A friendly press

In addition to being on friendly terms with our customers, our relations with various newspapers throughout New England are definitely worth while We are always willing to track down news stories for the local paper and wire services even when the story involved does not concern our operations. In cooperating this way, the papers can rely upon us as correspondents and they, in turn, are generous in the treatment of our own news. We also see that our service is well known to travel bureaus and hotel porters.

On extended charter trips we have been able to put across the idea that the customer has all the advantages of private plane ownership, but carry none of the financial burden. This appeals to some of our customers who seem to delight in saying, "My plane," or "My pilot"

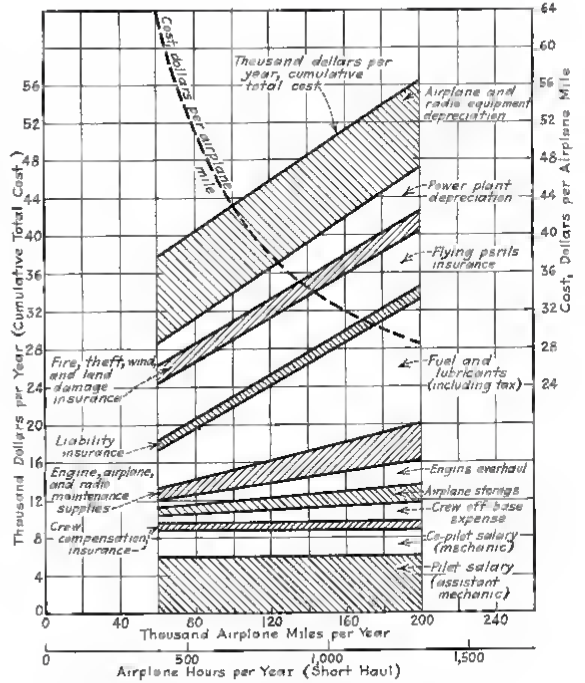
It is pleasant to report that there is money in charter flying. I do not mean that we found a gold mine, but we have grown in three years from a one-ship operation to a business utilizing several airplanes and have found it necessary to take over one of the hangars at the Boston Airport. The entire building, motor and airplane shops included, are under our supervision We have developed a clientele of desirable customers (those who pay their bills) and we operate our planes as a business and not a mad orgy of money-spending Such operation has a justifiable financial return, providing you are fortified by capable pilots, a skilled maintenance force, economical airplanes and efficient management

East Boston Airport: not only a transport terminal but a good base for charter work

How much does it cost to operate a modern transport on executive or industrial aid service? Here's a picture story in airplane economics to answer a question frequently asked by executives who are interested in airplanes as business tools.

How Much Does It Cost?

By Herbert V. Thaden



With a chart of this type an industrial executive may easily balance out the cost of his normal ground travel requirements with the cost of doing the same job by air in a company-owned ship

INDUSTRIALISTS and certain private citizens who are finding themselves under pressure to be "in two places at once" are again looking to the airplane as a practical solution to their problem. Their attitude has changed a great deal, however, since 1928-29 In those days companies invested their money in airplanes and didn't worry too much about what it cost them. It was all charged up to publicity anyway. Now, however, the executive wants to know what he is going to get for his money and whether or not he can show savings over other forms of transportation This study is intended to help answer such questions.

The airplane used in this illustration is a contemporary two-engined all-metal monoplane with excellent performance It will seat up to ten people. Its first cost including all the necessary radio and navigational extras should be under $60,000

The chart summarizes all the cost charges for one specific case studied in dollars per year on a cumulative basis and includes also a curve showing the cost in dollars per airplane-mile on a yearly basis for varying degrees of use Included among the charges are all those technically warranted as well as those considered desirable for the protection of a large industrial company. It is assumed that the crew will consist of pilot and co-pilot who will, between them, take care of the necessary maintenance and line servicing Engine overhaul is excepted, however, being assumed let out to some outside shop Crew expenses and storage charges for the airplane will vary somewhat, and will depend to a considerable degree upon the extent of absence of the ship from its home base

Certain items of expense remain fixed regardless of the amount flown per year, including pilots' wages, compensation insurance (in certain states), hull and liability insurance and airplane depreciation

Depreciation has been calculated by writing off 90 per cent of the original value of the airplane, less the value of the power plant, either in four years, or on a total life of 8,000 hours, whichever gives the greatest rate. On industrial service with one pilot available it is unlikely that the ship will be flown in excess of 1,200 hours per year, hence the obsolescence rate (four years) has been used in developing this chart.

Obviously, the more a ship is used per year, the lower the cost per mile. Notable is the fact that above 800 hours use per year the cost gets down into the neighborhood of 35 cents per airplane mile, which means that for the particular airplane studied, with a full load of ten passengers, the cost per passenger seat-mile is lower than average rail-plus-pullman rates

By applying the method herein outlined, anyone who is interested in considering the possibilities of any aircraft for private or industrial use, may easily reckon the costs for comparison with other means of travel.

Editorials

AVIATION

Five Into Three

AS TENSION around diplomatic gambling tables heightens, the nations of the world are playing their cards so close to the chest that even the keenest eyed kibitzer seldom gets as much as a glimpse of them. Ace-in-the-hole, and most carefully guarded card in each hand is the air force.

But if details are lacking, enough scattered information may be picked up here and there to piece together the broad picture. Allen comes from Germany (page 16) with accounts of activity on a breath-taking scale, reports recently confirmed by Goering announcements. Across the Rhine, and in Central Europe, France and her allies strive to keep pace with Hitler's factories. Italy's aircraft production is on a frankly war-time footing. Recently London announced a sudden decision to build England's air force to three times its present strength.

In the Far East, Japan only partly conceals behind a mask of oriental inscrutability an air consciousness second to none in the world. Holland to protect her colonies, modernizes and augments her aerial forces at home and in the East Indies. From the U.S.S.R. fragmentary reports give clues to a military aviation development on a scale scarcely credible.

▶As we write, from billboards, loud speakers and pulpits throughout the land comes the ancient message of peace and good will to men. But in spite of sentimental argument to the contrary, there is little prospect of lasting peace in the world today. Whether we like it or not, we are being rapidly forced into a position that can be made tolerable only if we are fully prepared to take care of ourselves in any international rough-house that may happen to develop. We still enjoy our "splendid isolation," the protection of broad oceans between us and the most potent sources of trouble. As a result we can get along with smaller protective forces than can many another country, but with conditions as uncertain as they are, it seems only a measure of good sense to define the minimum requirements for our national safety and then build to that mark in the shortest possible time.

Most powerful and economical weapon in our scheme for national defense is the airplane. We need good airplanes, and we need them in large quantities. Technically, we can match any country in the world. But something must be done about quantity immediately. The air arms have not been getting enough airplanes lately to keep up with replacements—to say nothing of expansion.

As the new year opens, the picture appears a little brighter. After long periods of negotiation, trial and test, contracts for some aircraft are finally being placed. The immediate future, however, carries a triple burden—replacements for two years, plus whatever expansion is to be undertaken.

The Secretaries of War and the Navy in their annual reports make recommendations for five year aviation programs. The Army is to "possess (at the end of that time) at least 3,000 combat airplanes of modern design, plus a considerable number which could be used for training, transport and for other purposes"—the Navy to "provide approximately 1,910 airplanes by 1940-42."

▶All of which sounds pretty impressive—but it is not enough. We won't quarrel with the number of ships asked for—the experts on the General Staff and in the Navy have probably calculated the requirements correctly—but, in view of conditions imposed upon us by the rest of the world, we are not moving up on our objective fast enough. With German production alone estimated at 3,000 to 4,000 planes a year at the present time, our own program of building our combined air forces to a total of under 5,000 units in five years seems ridiculous.

Events abroad are moving at too swift a pace for such leisurely progress. We must speed up. At worst, the job should be done in three years instead of in five. Even that may not be fast enough. Once under way, such a program could readily be accelerated in emergencies, and, if, at the end of three years, the present period of world crisis is over, production may then be tapered off to the point of maintaining the forces at safe numbers and efficiency by replacement. Only then, with our defenses in reasonably good order, can we afford to pause and have a look around to see what the rest of the world is doing before formulating future aerial policies.

This year we congratulated ourselves upon having some $52,000,000 to spend for Army and Navy aircraft. Next year as much as $80,000,000 may be available. But if it were necessary to double that amount to telescope the announced Five Year Plan into three, what of it? The whole amount required annually would be but a drop in the bucket of current expenditure—scarcely large enough to make a New Deal office boy bat an eye. Simply as an economical project for the creation of new employment in an essential industry, a Three Year Plan should pay national dividends. As a means of insuring us against future attack, the spending of millions now may some day save us billions.

Flying Equipment

Vultee V-11 Attack Bomber

Complete details of a new military type with interesting structural features and excellent performance

IN AVIATION for November (1935) we carried a picture and a very brief description (based largely on the single photograph then available) of a new military ship produced by Airplane Development Corp of Glendale. Now, thanks to Mr. R. Anderson of Vultee's engineering department, we can supplement that preliminary write-up in detail. Those familiar with the construction of the V-1 transport will recognize many points of similarity in the V-11. The layout has been extensively revamped, however, to fit military requirements. Maneuverability, high speed, and ability to carry heavy bomb loads over great distances have been primary requirements. Good pilot vision and ease of field maintenance have also received full consideration.

With a Wright SR 1820 F-53 Cyclone of 750 hp. (at 11,000 ft.) and a Hamilton Standard controllable pitch propeller, the V-11 turns up a 230 m.p.h. top at 11,000 ft., fully loaded as an attack ship. Further performance specifications appear below.

The fuselage is of full monocoque construction, circular in cross-section. The shell plating is fabricated from unformed flat sheets wrapped over and riveted to U-shaped circular bulkhead rings. With the exception of two longerons extending from the upper engine mount attachment fittings past the cockpit cutouts and two web members attached to lower surface of the fuselage through the wing section, there are no longitudinal members or stringers.

Wing loads are transferred to the fuselage structure through built-up ring sections at the front and rear wing beams, which are continuous members passing through the fuselage.

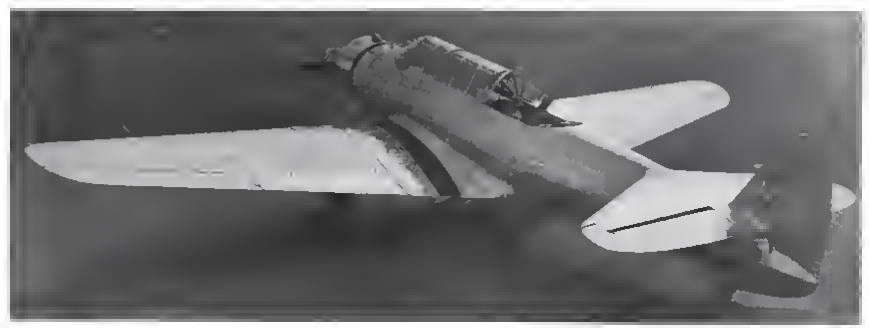
The construction of the fuselage affords a valuable feature in field maintenance. Major repair operations to the fuselage may be accomplished by reasonably skilled mechanics without the aid of jigs or other fixtures. Damaged shell panels are removed (by drilling out the rivets), flattened, and used as templates for cutting and drilling new sheet stock. The new panels will fit perfectly and the fuselage alignment is maintained by attachment to the undamaged sections.

The engine mount is a welded chrome-molybdenum tubular structure. In addition to the engine, the mount supports the engine cowl, the oil radiator and nearly all of the other engine accessories. Quickly detachable connections are provided on all engine lines and controls.

In addition to the safety feature afforded the crew by the fully retracted landing gear and fuselage runners on which the airplane may land in an emergency with only minor damage to the structure, protection to the pilot in nosing over, has been provided for by locating a tripod immediately behind the pilot's head. This tripod is designed to sustain six times the gross weight of the airplane.

The wing assembly is divided into three sections, a center and two outer panels. The primary structure of both the center and outer panels is of the stressed skin type of construction with spanwise corrugated strength members attached to front and rear shear beams and covered with a smooth skin of alclad sheet. Four removable nose sections and a removable tip section attached to the front shear beam give access to the interior of each outer panel. Ribs attached to the rear shear beams support the wing flaps, the flap and aileron mechanisms, and the skin aft to the trailing edge. Besides the landing gear, the center section panel supports the wing gas tanks, the center section wing flaps, and the bomb racks.

The outer wing panels are attached



The Vultee V-11 Attack Bomber, a formidable military weapon. It carries four 0x60 guns forward for offense, a flexible gun aft for defense. A variety of bomb loads may also be accommodated. Power plant is a Wright SR-1820-F53 Cyclone rated 700 hp. at 11,000 ft. Note unconventional tail arrangement.

to the center sections by bolts through aluminum alloy forgings riveted to each corrugation of the outer and center panels and the flanges of the end bulkheads of the center section panel. The center section is attached to the fuselage by bolts through the main fuselage rings and fittings on the longitudinal runners.

The ailerons are aluminum alloy framed, covered with fabric and attached to the wing by continuous hinges. Complete static balance is attained by a balance arm extending forward of the hinge center. Differential control action is used and a geound adjustable "servo" balance maintains lateral trim.

Split trailing edge wing flaps are used. The four sections of the flaps are 20 per cent of the wing chord in width and extend from aileron to aileron with a small gap at the center of the fuselage. Each section of the flap is built of chordwise corrugations covered with smooth metal skin and strengthened by a centrally located spar. Each section of the flap is connected to the wing by continuous hinges. The position of each section of the flap is controlled by an actuating mechanism of the cable sector and arm type connected and operated by a continuous cable driven by a manually or electrically operated gear box.

The horizontal stabilizer is also of the stressed skin type of construction similar to that of the outer wing panels. It is solidly attached above the fuselage forward of the vertical stabilizer and tail cone to avoid buffeting, and to improve control in a spin.

The rudder and elevators are of metal box spar and rib construction with fabric covering used on the elevators and metal skin on the rudder. An overhung balance is used on the rudder and each elevator is statically and dynamically balanced. An adjustable area of the Flettner type is provided on both elevators and rudder for directional and longitudinal trimming of the airplane in flight.

Shock absorption is obtained by means of oleo struts, rubber taxing pads and Goodyear airwheels. Each wheel and strut assembly of the gear is a separate unit which retracts into wheel wells and strut tunnels in the lower surface of the center section wing panel. The gear is retracted either manually or electrically by a system of torque shafts and bevel gears driving a worm and gear quadrant mechanism attached to the upper end of each landing gear strut. These struts pivot about bearing tubes and the operative mechanism rotates the struts inwardly into the wheel wells. Position indicator dials are mounted in the pilot's cockpit together with warning lights and a signal horn which operates when the engine is throttled with the gear in any except the full down position.

The full swivelling type tail wheel is also partly retractable into the tail cone and lower rudder fairing. Shock loads are absorbed by a hydraulic oleo strut and a coil spring is provided for taxing loads.

Either a Wright "Cyclone" SR-1820-F52 or SR-1820-F53 engine may be installed. The outer and inner engine cowl is made of aluminum alloy sheet, reinforced by stiffeners and mounted on brackets attached to the engine and the engine mount respectively.

The oil supply is carried in an aluminum tank of 30 gal. (115.5 liters) capacity mounted on the firewall. Temperature of the oil supply is controlled by an oil radiator mounted on the lower engine mount structure with a by-pass valve operated from the pilot's cockpit.

The maximum fuel capacity is 500 gal. (1892 liters) contained in four wing tanks and three fuselage tanks. The tanks are constructed of aluminum, shells and baffles riveted and welded together. Each tank is independently supported, filled, and controlled by selector valves.

The gunner's stick is removable for stowage purposes. With the exception of engine controls, no other flight controls or instruments are located in the gunner's cockpit. All flight controls and the bomb release mechanisms are located in a control pedestal mounted on the left side of the pilot's cockpit. The control mechanism for the landing gear and wing flaps is also located on this pedestal.

The Model V-11 is completely equipped for night operation. The wiring system for all electrical equipment is a 12-volt, two-wire ungrounded circuit adequately shielded to eliminate radio interference and fire hazard. A complete Western Electric transmitting and receiving radio set is installed. The transmitter is arranged to transmit on three frequencies, using either phone or continuous wave telegraph. The receiver is arranged to operate on two frequencies bands for radio telephone or any modulated radio service reception. A pressure type fire extinguisher is installed in the engine compartment and hand fire extinguishers are mounted in the cockpits. Hot or cold fresh air is supplied to the pilot through a controllable valve located in the cockpit.

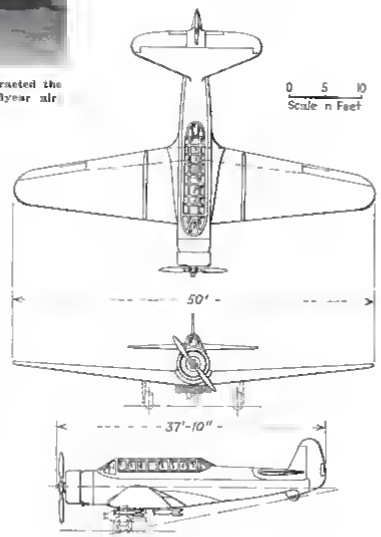
Ample space is available in the rear of the fuselage for the installation of an aerial camera, bomb sight, or other equipment for observation without sacrificing fuel capacity. Provision is also made for mounting oxygen equipment. Very pistols and other signaling equipment.

Four caliber .30 Browning free firing fixed machine guns are mounted within the nose sections of the two outer wing panels outside of the propeller disk. The guns are adjustable both laterally and vertically, manually charged by cockpit charging handles and electrically fired by a trigger grip on the pilot's control stick. Each gun is equipped with 600 round ammunition boxes and ejection chutes completely enclosed within the contour of the wing.

A caliber .30 Browning flexible machine gun is mounted at the rear of the gunner's cockpit on a semi-circular gun track attached to the supporting members of the tilting and revolving gunner's seat. Six hundred rounds of ammunition for this gun is carried in ammunition carton racks.

A total bomb load of 1,200 lb. (550 kg.) may be carried on internal and external bomb racks in a number of different combinations. Internal racks are provided in stainless steel chutes for twenty, 30 lb. (13.6 kg.) chemical or fragmentation bombs. The external racks are arranged in two groups of five each in tandem, and support either one 1,135 lb. (515 kg.) bomb, ten 120 lb. (55 kg.), three 285 lb. (130 kg.), or two 625 lb. (283 kg.) bombs.

Close up of landing gear of the V-11 Attack Bomber. With wheels retracted the under-surface of the wing presents a smooth unbroken surface. Goodyear air wheels and brakes are standard equipment.



Dimensions, Weights, and Performance Figures of the Model V-11

Wing Span	50 ft 0 in	15 25 m
Length Overall	37 ft 11 in	11 52 m
Height Overall	10 ft 0 in	3 05 m.
Wing Area	304 sq ft	35 71 sq m
Attack Mission		
Empty Weight	5 512 lb	2,497 kg
Useful Load	2,988 lb	1 353 7 kg.
Gross Weight	8 500 lb	3 850 7 kg.
High Speed at Sea Level	280 m p h	322 km per hr
High Speed at 11 000 ft (3 350 m)	230 m p h	370 km per hr
Operating Speed at 18 000 ft. (5 485 m)	217 m.p h	349 km per hr.
Cruising Speed at 20 700 ft (6 310 m.)	210 m.p h.	338 km per hr.
Landing Speed at Sea Level	65 m p h	105 km per hr
Maximum Rate of Climb at Critical Altitude	1 100 ft per min	335 m per min
Service Ceiling	24 000 ft	7 296 m
Absolute Ceiling	26 000 ft	7 904 m
Range at Cruising Speed	980 miles	1 440 km
Bombing Mission		
Empty Weight	5 512 lb	2,497 kg
Useful Load	5 288 lb.	2 397 6 kg
Gross Weight	10 800 lb.	4 894 6 kg
High Speed at Sea Level	181 m p h.	291 km. per hr
High Speed at 11,000 ft (3 350 m)	209 m p h	336 km per hr
Operating Speed at 18 000 ft. (5 485 m)	193 m p h	310 km per hr.
Cruising Speed at 20 700 ft (6,310 m)	185 m p h	298 km per hr
Landing Speed at Sea Level	70 m p h	113 km per hr
Maximum Rate of Climb at Critical Altitude	600 ft. per min	185 km per min
Service Ceiling	19 000 ft	5 776 m
Absolute Ceiling	21 600 ft	6,536 m
Range at Cruising Speed.	2 200 miles	3 540 km

New Kinner Engine

The model R-5, Series 2 develops 160 hp. at 1,850 r.p.m. at 2 lb. to the horsepower

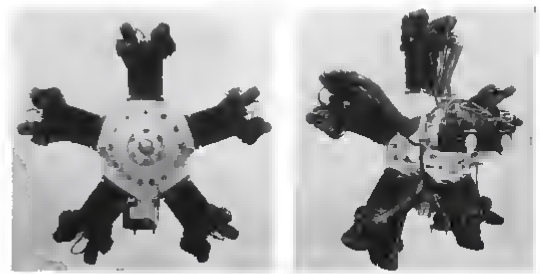
KINNER of Glendale has just announced a modified R-5 engine, similar to previous five-cylinder models but embodying a number of improvements.

Cylinder heads have approximately three times as much cooling fin area as on previous models. The fins are longer and and are spaced closer together.

Valve improvements include enlarged intake passages and valve diameters. The new rocker arm rollers are on needle bearings on the valve end which reduces side thrust and increases the length of the guides. High pressure grease lubrication is provided for the main roller bearings of the rocker arms and for the rocker end of the push rod. Push rod rocker arm adjusting screws are so designed that when they are removed the push rod may be withdrawn through the rocker arm opening for inspection.

Following usual Kinner practice, separate camshafts are provided for each of the five cylinders. Each camshaft carries a spur gear driven by a pinion gear on the rear end of the crankshaft. Magneto drives are taken off the camshafts through spur gears. Oil pressure and scavenger pumps are driven off two of the five camshafts. Provision is made for Eclipse compressed air starter or the Eclipse Y150 direct electric starter. Generator and fuel pump drives are also provided. Each accessory has its separate mounting pad. Provision is made in the oil sump for Cuno oil filter. Battery ignition may be supplied at a slight additional cost.

General engine specifications include: horsepower, 160 at 1,850 r.p.m.; bore, 5 in.; stroke, 5½ in.; displacement, 540 cu. in.; compression ratio, 5.5 to 1; weight dry without hub, air heater exhaust collector, starter, generator or fuel pump, 325 lb. weight of rear collector rings, including air heating valves, 17 lb.



Front and rear views of the new Kinner R-5 Series 2 radial engine

Douglas Sleeper Transport

First of the DC-3's for American Airlines Test Flown at Santa Monica on Dec. 18

EVER SINCE we were permitted a glimpse of the DST, then in mock-up, almost a year ago we have been looking forward to an opportunity of passing along something about this airplane. In addition to its many interesting structural features, it is the first ship in the United States to be designed ' from scratch" with sleeping equipment on a par with the best Pullman practice The Condor sleeper (AVIATION, May, 1934) was an excellent job We have flown cross-country in it, both day and night, in great comfort. But, good as it was, its sleeping accommodations were of necessity adapted to an existing airplane and, as such, were subject to many compromises that were unnecessary in the DC-3

Spaciousness, heretofore obtained only in large flying boats of the S-42 and Martin 130 class, characterizes the 7 ft 8 in wide by 6 ft. 6 in. high passenger cabin. Fore and aft, it is divided into eight sections, four on each side of a broad aisle. In each section are two seats, each 36 in wide, facing each other For night work, the seats and backs fold down to form a soft foundation for the mattress of the lower berth. Upper berths drop down from the ceiling in the approved Pullman manner,

Each berth is 6 ft. 5 in long Lowers are 36 in wide, uppers 32 in Six-inch clearance between the floor and the under part of the berth makes a convenient storage space for small hand baggage Upper surface of the lower berth is 14 in above the cabin floor *Upper berths are 46½ in. above the floor.

The main cabin windows serve the lowers For the occupants of the uppers, smaller windows have been provided as shown in the accompanying picture. Both sets of berths will be fitted out with a full complement of reading lights, clothes nets, baggage racks and stewardess call buttons.

For the first time on land aircraft, separate dressing rooms are provided for men and women. Located at the rear of the cabin, they are fitted up with running water, mirrors, etc Separate toilet facilities are located off each dressing room A complete commissary department is located immediately behind the pilot's cockpit. Means are provided for storing hot or cold foods. The new equipment will permit the serving of much more elaborate meals than are now possible in most transports.

Baggage compartments occupy the usual position aft. Baggage space is also provided in the forepart of the cabin opposite the commissary. The pilot's cockpit is fitted with every known aid to navigation, including all approved instruments, Sperry automatic pilot and the latest type of two-way radio equipment.

Externally the ship is very similar in appearance to the DC 2 now in operation on many airlines at home and abroad, but overall dimensions are considerably greater Comparisons are of interest Where the DC-2 has a span of 85 ft and a length overall of approximately 62 ft, the DC-3 shows a wing spread of 95 ft., an overall length of 65 ft., and an overall height (on the geound) of 16 ft. 4 in. General arrangement of engines and landing gear is the same, but the fuselage shows a much more rounded cross-section, wings are more strongly tapered, and the vertical tail surfaces, relatively speaking, have been considerably enlarged. Landing gear is of similar type to that of the DC 2, with wheels folding forward into the engine nacelles.

Gross weight of the DC-3 will be 24,000 lb, or some 5,000 lb. more than the licensed all-up weight of the DC-2

Power plants are the latest Wright Cyclones, each with 930 hp available for take-off and 850 hp maximum at 4,300 ft. Top speed is 215 m.p.h at 10,000 ft. On 70 per cent power at 12,000 ft, normal cruising will be at 190 m.p.h The ship will have a range of 1,100 miles with 24 passengers, or 1,400 miles with 16 passengers. Landing speed is 65 m.p.h

Sufficient power will be available to permit conclusion of take-off and climb with one engine dead. Engine equipment will include the Hamilton Standard automatic constant r.p.m. propellers (AVIATION, December, 1934)

[The above information is based on a preliminary release from the manufacturer As time goes on, and as production ships begin to appear we anticipate publishing at greater length something of the structural characteristics of this airplane.—Ed.]

The large windows serve lower berths, the smaller, the uppers in Douglas' new sleeper transport. Similarity to DC-2s is evident Most striking change visible is the relative enlargement of the vertical tail areas

Unmistakably Douglas is the new DST, the first of which has just been test flown before delivery to American Airlines. Power plants are Wright Cyclones.

Kellett for Army

Jacobs powered direct control giro delivered to Air Corps

IN THE December (1935) issue of AVIATION, thanks to Mr R H Prewitt, we presented a complete description of the mechanical features of the Kellett KG-1 direct control autogiro Announcement has just been received that a machine of this type, a Model YG-1, has been delivered to the Army Air Corps. The mechanical details of this ship are practically the same as those described for the KG-1. The power plant is a 225 hp Jacobs radial Of particular interest is the method of securing the folded rotor blades shown in one of the accompanying pictures

Kellett YG-1 direct control autogiro with Jacobs power as delivered to the Army.

Foreign Builders

Composite aircraft building for Imperial Airways

IF THE idea for a composite aircraft (as illustrated on p 46 of this issue) had been suggested by a lesser inventor than England's Major R H Mayo, if a less reputable firm than Short Brothers of Rochester had undertaken to build one, and if an airline of smaller reputation than Imperial had underwritten it, the scheme might reasonably have been written off as too fantastic for serious consideration. But regardless of what we might think of it, the actual work on the ship is well under way, and flight tests may be expected some time this spring or early summer,

Basic idea is to permit the launching of a very heavily loaded airplane, in the air, from the back of another larger, but very lightly loaded airplane In effect, at take-off, the composite machine is a biplane of unequal span and chord. The power of all engines of the combination is available to get into the air Although the long-range cargo carrier (top component) has very heavy power loading and a high wing loading, the loadings of the composite craft can be made to permit satisfactory take-off and climb Landing the cargo carrier at destination is not so much of a problem because fuel load will be so reduced to bring wing loadings down to somewhere near normal.

Once in the air, and at a height and speed readily calculable from the aerodynamic characteristics of the two ships, the locking device tying them together may be released and the components separated The cargo carrier then proceeds at high speed to its distant objective and the "mother ship" returns to its base. Even theoretically, however, it isn't quite as simple as that. The problem of separation in the air involves a careful selection of airfoil sections and a nice calculation of lift coefficients, and weight distribution It may be shown, however, that if a certain critical speed can be reached, the resultant forces acting on the two components will tend to assist separation rather than hold them together.

The practical problem of piloting technique must await flight testing for ultimate solution Probably, take-off will be in the hands of only one of the pilots, most logically the "skipper" of the mother ship The flying controls of the upper unit will be locked in neutral until separation, but the engine controls of both ships should be synchronized, and probably will have to be connected by some means to the cockpit of the larger ship The pilot of the upper ship will function merely as a passenger until his ship clears the carrier.

Little is known so far of the actual characteristics of the Short-Mayo composite except that the lower unit will be a large flying boat and the upper a twin float seaplane Both units will probably have four engines

Close-up of the Kellett YG-1 tail showing method of securing the folded rotor blade.

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Bright Finish Tubing

Summerill produces oxide-free steel tubing for aircraft use

ONE of the greatest objections to the use of ordinary chrome-molybdenum (4130-X) steel tubing was the heavy scale that adhered to the surface as a result of normalizing in open furnaces. Scale on surfaces made inspection difficult and made trouble in welding, but for a long time it was accepted as one of those things about which nothing could be done. Some time ago the Army and Navy wrote a new specification (57-180-2C) requiring normalized tubing to be free from scale. The response by manufacturers was almost immediate and smooth finished tubing became standard for aircraft use. But this tubing, although scale-free, was still characterized by a coat of dark oxide.

The advantage of going still further and producing a really bright finished tubing became obvious some time ago to the Summerill Tubing Co. (Bridgeport, Pa.). It has recently been producing as a standard product a completely oxide-free tubing which makes the detection of imperfections by inspectors easy and which reduces the oxide contamination in welds during assembly. Sand blasting is entirely unnecessary. The appearance is almost that of cold finished steel. This result is obtained by normalizing the tubing in a controlled furnace atmosphere and subsequently treating to remove the film.—AVIATION, January, 1936.

Accelerometer

New Pioneer instrument for recording aircraft acceleration

FOR instrument board mounting, Pioneer Instrument Co. (754 Lexington Ave., Brooklyn, N. Y.) has produced the Type 725B accelerometer to indicate acceleration or deceleration of an aircraft in gravitational units. The instrument is useful in determining wing loading during test flights. It also serves to warn the pilot against subjecting the aircraft to excessive strains in violent maneuvers. The dial is similar to other standard aircraft instruments. It is calibrated from —1 to +8 gravitational units. The face carries two hands, one of which is an indicating hand and the other a maximum reading hand which stays in position at the point of highest indication until reset by a knob on the bottom of the case. Mounting is of the standard SAE type on 3½ in. diameter bolt circle. The weight complete is 14 oz. List price of the instrument is $115.—AVIATION, January, 1936.

Aviation Battery

New non-spillable battery developed for aircraft use

A NEW type of battery in which the insulation is so designed that if the battery is inverted the electrolyte is completely absorbed has been announced by Reading Batteries Inc. (Reading, Pa.). The absorbent characteristics of the insulation have made it unnecessary to provide a sediment chamber at the bottom of the case and also have eliminated the conventional air chamber above the plates. The battery may be inverted for long periods without harm to itself or without dangerous leakage. It is claimed that some 25 per cent more active plate surface and approximately 50 per cent more active material may be included in the battery without increasing its outside dimensions. The top of the battery, including the terminals, is covered with a hard rubber self-ventilating cover. Hydrometer readings are, of course, impossible, but the condition of the battery may be checked periodically with a voltmeter.—AVIATION, January, 1936.

The Pioneer 725B Accelerometer

Reading aviation battery

Skyscraper Camera

Fairchild builds aerial camera with a focal length of 24 in.

MADE up specially for photographing skyscrapers and making aerial views of New York City, Fairchild Aerial Camera Corporation of Woodside, L. I. has built a so-called "skyscraper" camera three or four times as tall as the average aerial camera. It has a focal length of 24 in., an overall height of 3 ft. The lens is an F 6 with a between-the-lens shutter. The magazine holds 75 ft. of film, or sufficient for making 110 7×9 in. pictures. Loaded with film, it weighs 60 lb. The cone which supports the lens protects the mechanism from dust and from the air stream.

Using this camera the photographer can fly twice as high as formerly and get the same, or better, detail. The long focal length eliminates the "leaning" effect of tall buildings. From a military point of view the advantages of the camera are obvious.—AVIATION, January, 1936.

Fairchild's new "skyscraper" camera

Low Temperature Oil

New substance increases viscosity index of Stanavo Servo Oil

A NEW substance to increase the viscosity index of oils of all types for use in hydraulically operated units has been developed by the Standard Oil Co. of New Jersey. Although adaptable to all types of oils it finds special use in Stanavo Servo Oil which is applied particularly to automatic airplane controls. Viscosity control is important where the operation of hydraulic units must not vary greatly in changing temperature conditions if accurate operation is to be insured. Reports indicate that the treated Servo Oil is especially adaptable to automatic pilot mechanisms and to shock absorbing systems.—AVIATION, January, 1936.

Catalogs

A digest of trade literature recently received

ENGEL AIRCRAFT SPECIALTIES, 1729 Standard Ave., Glendale, Cal.—Bulletin—ten pages, paper covers. Describes sheet metal cowling, wheel pants, exhaust manifolds, fairings.

Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago. High Frequency Tool Catalog No. 60. Complete coverage on Thor electrically driven hand tools, also Universal electric tools, pneumatic tools and contractor's tools.

Sensenich Bros., Lititz, Pa.—Four-page folder covering S-3 wooden aircraft propellers and accessories.

Skilsaw, Incorporated, 3310-20 Elston Ave., Chicago, Ill.—Catalog No. 36. 33 pages, paper-covered. Covers complete line of Skilsaw portable electric tools (saws, grinders, dryers, sanders, etc.).

Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J.—Weston Aircraft Instruments. Ten pages, paper cover. Contains the complete line of aircraft instruments (including synchroscope, tachometers, temperature measuring instruments, blind landing indicators, etc.

Abstracts

High Speed Aircraft

Paper before the Bristol Branch, Royal Aeronautical Society, by R. M. Clarkson

WHEN the DeHavilland Company undertook the design of a machine for the specific purpose of winning the MacRobertson race, they considered the alternative options of the highest possible speed and moderate range or of sufficient range to eliminate stops between the required controls and a more moderate speed. They decided on the latter after concluding that they could either get 260 m.p.h. with 1,700-mile range and half a dozen intermediate stops as a result, or 220 m.p.h. with 2,800 miles of non-stop flight.

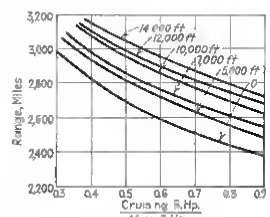
With the high-speed moderate-range combination, controllable-pitch propellers might have been a minor matter. With the characteristics eventually adopted they seemed essential, especially in view of the take-off specifications set by the racing rules. A fixed-pitch propeller would have reduced the range from 2,800 miles to about 1,800.

The range required determined the cruising power conditions, as the range at full power at sea level would have been only 2,300 miles, 20 per cent less than was needed for the longest stage of the race. As indicated by a set of curves, to get the needed range from London to Bagdad the cruising power would have had to be kept to 42 per cent of the rated maximum for sea level flight, but at 10,000 ft. it could be raised to 66 per cent and at 14,000 ft. to 79 per cent. As the engines were not supercharged, however, they were incapable of developing 79 per cent power at that altitude, and the 10,000 ft. altitude proved to be the most efficient one. The cruising speed there was 224 m.p.h., while the highest cruising speed compatible with a 2,800-mile range at sea level would have been only 170.

The absence of supercharging was the result of careful analysis. Supercharging might have made it possible to increase the speed by another 20 m.p.h. by going to 14,000 ft., but the severity of the take-off requirements would then have made ground boosting necessary, and the increase of weight, the loss of simplicity, the effect on the pilot of high altitude flying over long periods, and the necessity for using doped fuel for the take-off were considered to more than offset the possible gain in speed.

The wings of the Comet had a section with upturned trailing edge for stable center of pressure travel, and with split flaps over one-fifth of the span. With a wing loading of 26.1 lb. per sq.ft. the plywood-covered wooden wing weighed 2.92 lb. per sq.ft., or 11.2 per cent of the total weight of the ship. The gross weight was 5,550 lb., including 2,117 lb. of fuel and oil. The minimum speed with flaps down was 78 m.p.h.

It is of great interest in connection with high-performance airplanes to compare their characteristics with those of the ideal streamlined machine having the same wing area, fuselage section, and weight, but with absolutely no turbulence interference or eddy-making resistance, and drag reduced to skin friction and to the induced drag inescapably connected with the lift-producing properties of the wing. The total profile and parasite resistance of the Comet is estimated to be only 48 per cent above the pure skin friction, as compared with a corresponding excess drag of 77 per cent in the Douglas [by far the most efficient of the transport machines included in the tabulation]. Were the Comet to be reduced to the absolutely perfect streamlined form, subject to no practical considerations except those fixing the wing area and the cross-sectional area of the fuselage, its speed would have been increased only 14 per cent. The corresponding increase in the Douglas would have been 21 per cent [so that for the theoretically perfect streamlined airplane the constant K in the well-known speed formula $V_{max} = K \sqrt[3]{\frac{P}{w}}$ would be 220, as against the (av.) 180 of the best American transport and military planes at the present time; the figure to which K has been raised from the 140 that prevailed only five years ago].

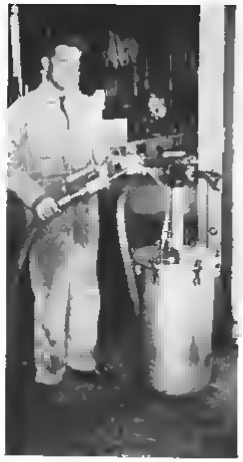


Cruising power output and range at various altitudes with take-off as required by racing rules

The Maintenance Notebook

Pressure Grease Gun

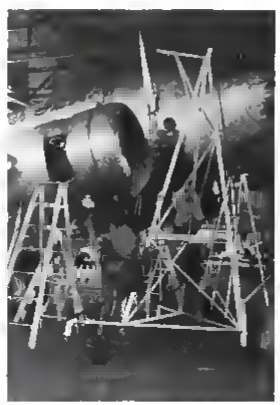
THE Pan American Airways' engine shops at Miami find considerable use in a high pressure grease gun which they have developed. The outfit consists of a welded up cylindrical tank with a gasketed clamp-on cover, mounted on casters for easy transport around the shop. An iron pipe riser, coming up through the center of the tank carries a T fitting at its head from which there are two outlets (1) an ordinary pressure type cock from which grease may be drawn into any open container, and (2) a length of hose to which suitable type of nozzle may be fitted for direct connection to bearings or closed containers. Where high pressure lubrication is required, a booster pump may be attached as shown in the photograph. Pressure on the main tank is obtained by periodic connection of the grease tank to the shop compressed air lines. One of the chief virtues of the apparatus is that it holds a lot of grease and does not have to be recharged every day or so under ordinary operating conditions. Its portability is also a great asset.



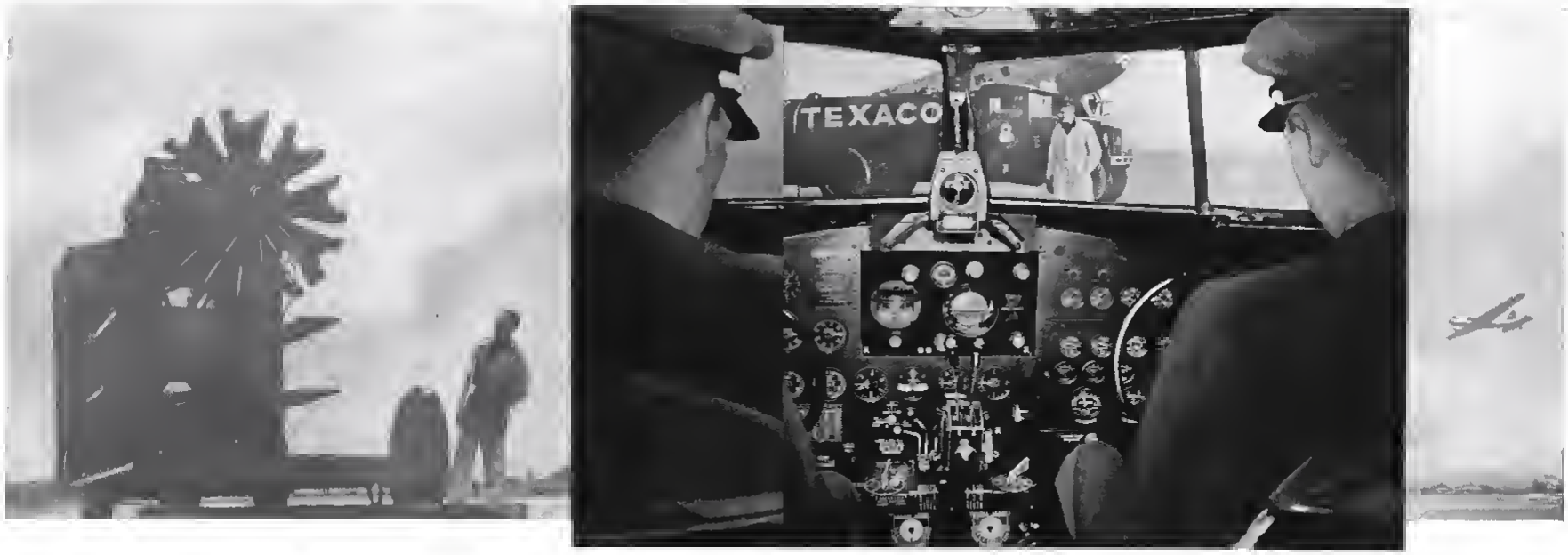
Pressure grease container in Pan American's Miami engine shops.

Handling EAL's Propellers

BELOW, a series of action shots showing how large propellers are handled and installed in Eastern Air Lines' new overhaul plant at the 36th Street airport at Miami. To the left, one of the pneumatic-tired dollies which may be handled quickly and easily between the service hangar and the adjacent propeller overhaul shop. Space is provided for handling two propellers at the same time. Note the protected spindle and locking arms. In the center, a tripod crane on rubber tired castering wheels is shown removing the propeller from the dolly preparatory to installation in the ship. A simple geared winch provides the necessary lifting power. Note how the strap is applied around the propeller blade to allow the assembly to hang at the proper angle for slipping it over the propeller shaft of the engine. A plank bolted across the side bracing members of the tripod provides a working platform at just the right height for the installation. Using this outfit, the transfer of large propellers from the ship to the dolly (or vice versa) is a matter of minutes.



The one—two—three order at Eastern Air Lines' new Miami base. Big propellers come from the overhaul shop on the dolly, are lifted off by crane, and installed on the propeller shaft. The transfer of large propellers from ship to dolly (or dolly to ship) can be made in three or four minutes.



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★

TEXACO AIRPLANE OILS

★

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In the world's toughest proving ground, these products have won first place. You, too, can have the same trouble-free performance that these transport companies get.

You are assured of constant pressures, freedom from stuck rings, and less wear when you use Texaco Aviation Lubricants. And here is why.

Working hand-in-hand with the builders of your engines, Texaco Engineers have developed superior types of aviation lubricants and fuels to meet exacting flying conditions. Advanced Texaco refining methods produce oils with less carbon, and low pour test, assuring free circulation at all operating temperatures. You can benefit from this cooperation and the high qualities of these products, as have three-fourths of the major transport companies. They have found that Texaco Aviation Products fill their most exacting requirements.

See a Texaco representative who knows the characteristics of your engines as well as the characteristics of Texaco Products. He can give you sound advice on any lubrication problem.

★

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Aviation Lubricants

Operator's Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 13: What do you do to get the public out to your airport? What methods such as air meets, radio broadcasts etc., have you employed for this purpose?

Pool for a Jumper

SINCE there are about eight operators on the field, we pool a sum of 50 cents per passenger seat operated and use the proceeds to pay for a parachute jump or any other form of amusement which would assist us in bringing people to the airport on Sundays. This plan has worked reasonably well. When possible we get radio announcements and have been almost universally successful in getting small articles in the local newspapers.—WINSTON W. KRATZ, *President, St. Louis Flying Service, Inc., St. Louis, Mo.*

★

QUESTION 14: What is the price asked for your shortest flight? Have you ever offered flights at a lower price and if so what was the result? Have you had other ships barnstorming at your port charging less and if so what was the result of their operations? Have barnstormers using Fords or similar equipment, and charging only 25, 50 and 75 cents helped or retarded your business? (Submitted by George C. Duvall, Mississippi Airways, Davenport, Ia.)

Cheap Rides Don't Pay

OUR price for our shortest flight is 1 cent per lb. On a few occasions we have carried passengers at $1 and I am thoroughly convinced that we lost money. I am answering this question as a barnstormer rather than an operator. I have made a business of barnstorming for fifteen years. The public has had nothing to do with forcing the price of pleasure flights down where there is no profit in them. It has been done by the cutrate, cutthroat barnstormer who couldn't see beyond the dollar he had in his hand. These cut-rate artists are like a flock of flying ants. They cause a certain amount of surface annoyance but they are short lived. A couple of winters ago I was driving along a road through New Jersey on the way to New York. We passed an airfield. It was all grown up to weeds and grass. There were two hangars on it. Both vacant. The doors had fallen off of one. And beside the road still stood a sign with three words that told the whole story. Those three words were, "Air Rides—fifty cents."

There is no question in my mind that this under-rate stuff hurts flying and cheapens it in the eyes of the public. We operated off a number of fields this past summer right along side of other ships charging a much smaller rate and did by far the biggest bulk of the business. And we did it by selling the public on the idea that they should and did want to pay a price commensurate with keeping our equipment in an air-worthy condition for them to ride in.

With reference to cutting prices, I want to mention an incident that occurred this summer. Early in the evening of July 1st, we dropped down on a C.W.A. Airport in a little town in Dakota. Quite a fair crowd came out to look us over. We tried to carry some passengers at our regular price. No one would ride but most of them seemed to indicate that they would go up for a dollar. We went into a huddle and, after talking it over, decided that as we were not advertised there and did not expect to come back there we would fly that night at $1 a head. We loudly broadcasted this information fully expecting a grand rush for the planes. The net results of our high-powered salesmen that night was three passengers. On July 3d, at a neighboring town where we were advertised and carrying passengers at the regular price, these same people drove over and went up with us without a squawk, merely mentioning the fact that they could have ridden Monday for a dollar. This leads me to conclude that it is not the few cents a head less that gets people to ride, but those few cents spell the difference between profit and loss to the operator.—E. M. CANFIELD, *Canfield Flying Service, Inc., Williston, N. D.*

Question 14

(Answers will be published in February)

WHAT do you think of the present regulations for medical examinations for flight students? Do they discourage students from getting started because of the expenditure of time or money involved. Would there be any great risk in amending them to defer the examination until the student had several hours of dual? Should the number of medical examiners be increased or should the examination privilege be extended to other physicians? Should the Air Commerce Bureau permit operators to charge for the flight demonstration time up to one hour that is now allowed only if given free?

Question 15

(Answers will be published in March)

DO YOU give free instruction to plane purchasers? If so, do you give them any further instruction beyond solo? Do you charge for demonstration time given in selling airplanes? In the sale of planes for executive or business service, do you give the prospect an opportunity to use the ship on trial?

One Dollar Is Minimum

THE price asked for our shortest flight is $1. We have many times considered the establishment of a 50 cent rate here on the field but it is the consensus of all of us that a 50 cent rate would be most harmful to the smaller operators, although it might result in increased activity for the two of us who operate tri-motors. We also feel it is quite probable that, if we should reduce the rate to 50 cents per passenger, we would undoubtedly enjoy a temporary increase in business but we would soon exhaust the marginal group of potential riders and our repeat business would probably be no greater charging 50 cents than it now is charging $1. Due to the wisdom of the city officials here at the field, outside barnstorming units are not permitted to carry passengers on this airport at less than our established rate of $1.—WINSTON W. KRATZ, *President, St. Louis Flying Service, Inc., St. Louis, Mo.*

Port too far from city

OUR lowest price ride is $1.50 but our city is too far from the airport to operate profitably and there is too little volume in passenger flights nowadays. Ford planes have been here once or twice and do well the first Sunday but that is about all. If we had any volume of passenger business we would not let any concern come in and underquote our reasonable charge. But as we are not strictly in the passenger business it makes no difference to us what any one charges as we are not able to reduce our $1.50 rate. If others think they can that is agreeable to us as we are only too glad to see as many folks ride as possible and as cheaply as possible.—L. G. MASON, *Montgomery School Aeronautics.*

News of the Month

★ ***World Transport*** . . . **British-Irish-Canadian delegation holds conferences in Ottawa then meets American officials to discuss transatlantic agreement. Start of joint Pan American-Imperial Airways operation held likely in 1936.**

★ ***Domestic Transport*** . . . **Airlines leave Chamber to set up their own association . . . New interline scrip agreement . . . New insurance available . . . New blind flying regulations . . . Douglas Sleeper meets first flight tests . . . Eastern traffic booms . . . National plans for Electras . . . Inter-island receives S-43 Sikorsky seaplanes . . . United gets bids on 40 passenger transports . . . Airline Maintenance men meet in Miami . . . Pennsylvania and TWA announce new reductions in fares on many schedules.**

★ ***Army*** . . . **Air Corps orders attack planes from Northrop, bombers from Douglas and Boeing.**

★ ***Outstanding Flights*** . . . **Benjamin King sets two more international marks for light seaplanes . . . Air Corps Douglas breaks amphibian distance record . . . U. S. moves back into lead in international record contest . . . Miami Meet, hampered by weather, featured by GHQ demonstrations.**

★ ***Industrial*** . . . **Lockheed planes delivered to Pan American and LOT . . . Fairchild amphibian wins ATC . . . Sikorsky operating at near capacity . . . Stinson observes tenth anniversary . . . Taylor passes 200 mark for 1935.**

★ ***Financial*** . . . **Imperial Airways reports gains in traffic and profits . . . Consolidated reports three quarter profit . . . Kinner reduces losses.**

All Are Willing

British, Irish and Canadians meet American officials on transatlantic reciprocity

With startling suddenness, and while the China Clipper was still in the midst of its first transpacific air mail flight, the country's attention swung back last month to its favorite problem of ocean flying—the North Atlantic.

Since the first announcement four years ago of conferences between Pan American and Imperial Airways officials, the American aeronautical industry has generally accepted the idea that heavier-than-air operations between the United States and Europe would ultimately take the form of a cooperative service carried out by those two companies. Corollary belief has been that the chief cause of delay these last eighteen months has been a gentleman's agreement between the two companies that neither would start until both were ready. And obviously the British were not yet ready.

It has never been quite so simple as that, of course. Neither company could know with absolute certainty even what its own country's official reaction would be. There has been an increasing interest in participation in the project in France, Germany and the Netherlands. Even with England and the United States in complete agreement, some four other parts of the British Empire (Canada, Ireland, Newfoundland and Bermuda) entered the picture, each on a different status in relation to the home government. Portugal, which owns the Azores, also had to be reckoned with.

Knotty questions had to be faced as to each group's international air navigation rights, each group's share in flight operations, in traffic, in the maintenance of secondary activities such as meteorological and radio services. There was not even a definite agreement among the interested parties on the route to be first exploited.

Last month like a rolling snowball that gathered size and authority in its progress, a committee with a British core arrived in Washington for a series of conferences with American officials on the subject.

The original group of nine, headed by Sir Donald Banks, director of the British Post Office; Col. F. C. Shelmerdine, director general of Civil Aviation and G. E. Woods-Humphery, managing director of Imperial Airways, was joined in London early in November by an Irish delegation headed by S. P. Walsh and J. Leydon. Crossing to Canada they convened Nov. 22 with a large number of Canadian and Newfoundland officials at Ottawa. There they thrashed out the great bulk of their intra-empire problems.

Two weeks later, augmented by a substantial Canadian representation headed by J. A. Wilson, Controller of Civil Aviation, the British and Irish delegates arrived in Washington. There they met officials of our Post Office, Bureau of Air Commerce, and State Department. Postmaster Farley cheered everyone concerned with the announcement he would seek funds for a transatlantic service from the coming session of Congress. Pan American's Trippe and Imperial's Woods-Humphery announced their companies were in close accord. Then numerous closed conferences commenced.

On Dec. 12 as the session broke up, Assistant Secretary of State R. Walton Moore, chairman of the American Interdepartmental Committee on Civil International Aviation, issued the following statement:

"As a result of the conferences which have been in progress . . . understandings have been reached which it is confidently hoped will bring about the early establishment of transatlantic air transport services connecting these several countries. These understandings are based upon the principle of full reciprocity between the countries interested. They do not operate to exclude similar arrangements between the United States and other countries.

"The Department of Commerce has given its approval to the establishment of transatlantic airways by way of Canada, Newfoundland, and the Irish Free State to England, and by way of Bermuda to England, and from Bermuda to Puerto Rico, the latter route to be extended by mutual consent. The Atlantic seaboard ports in contemplation as termini are New York City, Balti-

more, Md ; Cape Charles or Norfolk, Va., and Charleston, S C , any one of which may be designated as ports of entry, but no final determination with reference to places has yet been made

"It is recognized that the northern route is much shorter than the southern route and therefore will have the advantage of more economical operation but this fact does not preclude the possibility of considerable use being made of the southern route It is expected that experimental flights will be begun early in the summer of 1936, and it is hoped that scheduled services will begin by the summer of 1937. When the full regular service is inaugurated it is provided that there will be four round trips per week

"The matter of the carriage of mails is necessarily postponed for future consideration

"All of the conferences were characterized by a spirit of wholehearted cooperation and the conclusions arrived at received unanimous approval of the conferees."

Between the Lines

Transport operators take group action on Chamber membership, scrip books, insurance and blind flying rules

Four widely divergent yet important problems facing the country's airlines last month moved definitely toward solution

(1) The process of dissociation from aircraft manufacturing activities reached completion far beyond actual legal requirements with the announcement that all the airlines which had been members of the Transport Division of the Aeronautical Chamber of Commerce had severed connections with that body, and would organize a chamber of their own, an airline association, to be devoted solely to the promotion of the interests of air transportation.

(2) An interline agreement was announced whereby air travel scrip books will be made available to travelers after the first of the year which will be good for transportation on virtually every air line in the country and which offer 15 per cent savings in one-way passage and 5 per cent savings in round-trip rates Minimum size books bearing a face value of $500 will cost $425

(3) Six of the largest casualty insurance companies in the country came forward with a new policy for airline commercial travelers which will enable American firms to insure their employees against death on recognized airlines at the low rate of $1 per $1,000 per year.

(4) The Bureau of Air Commerce published the recommendations of the conference that had met under their auspices in November to draw up regulations to govern bad weather traffic on crowded airlines and in the neighborhood of crowded airports. General rules relating to blind flying by all aircraft were reported in the December issue of AVIATION The recommendations now published set up comprehensive recommendations as to general airline reporting and movement control and prescribe detailed procedure for the Chicago, Newark and Toledo-Cleveland sectors.

Genealogy of AVIATION

AVIATION was founded by Lester D Gardner, the first issue appearing Aug 1, 1916, as *Aviation and Aeronautical Engineering* In 1920, the *Aircraft Journal* was absorbed and the title became *Aviation and Aircraft Journal*, to be simplified into AVIATION in January, 1922 The chief editors have been Ladislas d'Orcy, W Laurence LePage, Earl D Osborn, R Sidney Bowen, Jr., and Edward P Warner

The present staff consists of S Paul Johnston, acting editor; Leslie E Neville, managing editor; Daniel C Sayre, assistant editor; and David J Leisk, art director

Maintenance

Airline Committee holds winter meeting at Miami

AMONG hundreds of aviation people who trekked to Miami during the week of Dec. 8-14, were fifteen members of the Maintenance Committee of the airline association (formerly Air Transport Division of the Aeronautical Chamber of Commerce) Available for conference on questions under discussion were representatives of manufacturers of airplanes, engines, accessories, materials, fuels and oils. Manufacturers, recognizing the importance of the work of the committee, are sending more of their men to attend the meetings There were eighteen at the Brownsville meeting (Jan 1935), 43 at Detroit (July, 1935), 78 at Miami

Three full days (Dec. 11-12-13) were required to dispose of an agenda that covered subjects ranging from water in gasoline (and methods of removal) through the whole list of troubles to which the modern aircraft falls heir Above all else, safety was the paramount issue

Scene of the meetings was the Hotel Pancoast on Miami Beach The heavy work of organizing, the program of work and entertainment rested, as usual, on the able shoulders of Secretary Fowler W Barker TWA's Walter Hamilton presided At the final session his term of office as committee chairman was extended into June, 1936,—to include the next meeting S Paul Johnston, acting editor of AVIATION, was elected first honorary member of the committee.

Present by special invitation were Senator Royal S Copeland and Col. Harold Hartney, of the Senate's air line safety committee; Col. Carroll Cone, Major R. W Schroeder, Irving W Metcalf of the Bureau of Air Commerce, Peter F Heenan, Secretary of the Department of Lands and Forests, Province of Ontario, and George Ponsford, also of Ontario (See pictures, page 23.)

NO SPOOFING

this is what the Mayo long-range composite aircraft being built in England will look like. After take off the small heavily-loaded upper unit disengages from its taker-off and flies on alone **(See also page 33)**

Transport Moves Ahead

Last month's developments on American, Eastern, Inter-Island, National, Pennsylvania, TWA, and United

"MAKES a neighborhood of the nation" and "No" were the results announced last month for two features of American Airlines' 1935 publicity program. The first had won a contest for the best slogan submitted for the airlines' use and brought its author, F. S. Randall of Ann Arbor, Mich., two round-trip transcontinental passes. The second was the overwhelming concensus of the answers received to a question featured in a wide campaign of advertising—Would you like a cocktail served you on air trips? Both features netted the line over 200,000 replies each. More vital American item: The first of its ten new 16-passenger Douglas DC-3 sleepers (See page 34) under construction at Santa Monica, passed beautifully through its first flight tests Dec. 18. Douglas' vice-president and test pilot, Carl Cover, after a 40 minute flight pronounced the DC-3 "distinctly easier to fly than the smaller (DC-2) types."

Eastern Airlines' annual winter pick-up this year started in early December, some two weeks before its usual date, and has already required doubling of morning and evening sections. It promises to reach higher figures than in any preceding season and last longer. Because the airline has itself opened new possibilities of worthwhile short-term winter holidays in Florida, northward traffic has already reached a level of almost the same proportions of southbound figures. Bookings out of New York are almost solid for schedules two and three weeks ahead.

Inter-Island Airways, which was expecting to receive two Sikorsky S-43 amphibians by the middle of January, last month summarized some interesting figures on its six years of operations between the islands of the Hawaiian group. In that period 60,000 passengers had been carried, and 1,500,000 plane-miles flown without a single accident. Traffic for the first nine months of 1935 totaled 10,071 passengers compared with 7,757 for the corresponding period of 1934. Flights which are daily except Sunday have been recently sold out day after day to passengers anxious for a view of Manua Loa, the active volcanic peak on the island of Hawaii.

Boston and Maine Airways, division of the National Airways, has announced it will replace the Stinson equipment now in use with Lockheed Electras as soon as airports along its route to Bangor are brought to satisfactory size and condition. Boston, Augusta, and Waterville are already approved. Portland has started work on a third runway which will complete its quota of facilities. Bangor has formed a committee to promote improvements there. Studies are also being carried out on the Boston-Burlington route of the line's Central Vermont division to determine the practicability of using Electra equipment there also. Both divisions recently completed installation of complete two-way radio equipment.

Pennsylvania Airlines has announced radical new slashes in its passenger tariffs, samples. Pittsburgh-Washington now $10.75, was $16; Cleveland-Washington now $17.75, Detroit-Washington now $25.65. In many cases the new rates are substantially below rail-plus-Pullman charges.

TWA has also set up a new schedule of rates: New York-Pittsburgh now $22.95, was $24, New York-St. Louis now $56.95, was $61.90, New York-Albuquerque now $116.45, was $127.

United's month was featured by the announcement that bids were opened Dec. 11 at that company's Chicago headquarters for what is to be its next equipment order, a fleet of ten 40-passenger four engined transports. Gross weight of the new ships will be in excess of 54,000 lb., their fuel capacity will be 1,600 gal., their wing span at least 145 ft., their cruising speed 200 m.p.h., their crews will consist of five members. No announcement of the successful bidder has yet been made. United also issued a set of figures (December estimated) for its 1935 operations:

	1934	1935
Mileage flown	13 609 659	15 000 000
Revenue passengers carried	142 139	180 000
Mail carried (lb.)	3 245 742*	6 600 000
Express (tons)	547	900

(*Company did not carry mail from Feb. 19, 1934 to May 8, 1935.)

Calendar

Jan. 6-7—Annual Convention of the National Aeronautical Association, Mayflower Hotel, Washington, D. C.

Jan. 29-31—Fourth Annual Meeting of the Institute of the Aeronautical Sciences, Physics Building, Columbia University, New York City.

Feb. 1-9—National Pacific Aircraft and Boat Show, Pan Pacific Auditorium, Los Angeles, Cal.

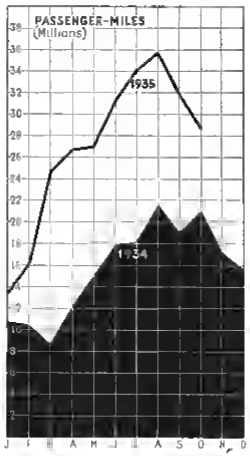
May 16, June 1—International Aero Exhibition, Stockholm, Sweden.

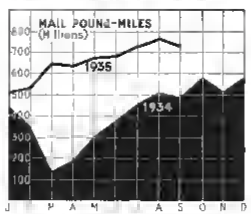
Sept. 3-6—National Air Races, Cleveland, Ohio.

Oct. 25—Paris-Saigon Air Race.

Traffic

Latest available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only





Miami Maneuvers

Air Corps flying headlines eighth Florida meet.

HAMPERED by high, gusty winds and low ceilings, the Eighth Annual All American Air Maneuvers last month (Dec. 12-14) struggled through a program of races, formation flying and stunting which would have been top-flight under better conditions.

With most racing events postponed until the final day, 89 Air Corps ships from the GHQ air force at Langley Field became the backbone of the program. Twenty-six Martin B-10 and B-12 bombers 27 Curtiss A-12 attack planes, 36 Boeing P-26 F pursuit planes made up the delegation which daily went through long maneuvers over the Municipal Airport

Noteworthy were two international marks for light seaplanes set by Benjamin King (see page 52); a 919 mi international distance record for amphibians set by Capt Cy Smith in an Air Corps Douglas between San Juan, P. R and Miami; Al Williams' stunting which won him the Rickenbacker Trophy; the amusing sheenanigans of a trio of Aeroncas flown by the "Three Mugs of Beer"

Free For All Race Results Green Trophy (550 cu.in), R. A Kling at 239.99 m p h , Art Chester second, S J. Wittman third, Dominican Republic Trophy (unlimited) Art Chester at 232.29 m p h , R A Kling second, Lee Miles third; Shell Trophy (550 cu in), Art Chester at 229 60 m p h , S J Wittman second, Lee Miles third; (200 cu in), C MacArthur at 105 14 m.p h , C Voelter second, T. C Chalk third.

C-License Race Results Cuban Trophy (unlimited), B F Stegall at 165 12 in a Travelair, Douglas Fonda second, Tex La Grone third; Curtiss Trophy (550 cu.in. cabin), Douglas Fonda at 161 92 in a Beechcraft, R. C. Barker second, Tex La Grone third, (550 cu in open cockpit) Tex Rankin at 104 55 m p h in a Ryan, C Szmagaj second J Musleh third, (800 cu in open cockpit), B F Stegall at 155 19 m p h in a Travelair Art Davis second, Tex Rankin third

WPA Airport Projects for which Treasury Warrants were issued between Nov. 22 and Dec. 22

Alabama (total to date)	**$130 454**
Birmingham	23 532
Arizona (total to date)	**233 118**
Arkansas (total to date)	**$53,788**
Jonesboro	3,508
California (total to date)	**$6,000,880**
Fresno	238,335
Redding	10 287
Sacramento	135 818
Salinas	10 318
San Diego	532 218
San Francisco	3 514 954
Santa Monica	3 532
Colorado (total to date)	**$166 833**
Alamosa	3 305
Denver	118,248
Monte Vista	4 368
Pueblo (corrected)	23,333
Connecticut (total to date)	**$480 118**
Danbury	188 488
Florida (total to date)	**$571 404**
Avon Park	3,340
Bushnell	15 941
Clearwater	37,364
Interlachen	33 318
Zephyrhills	18 224
Georgia (total to date)	**$93,708**
Albany	3,028
Illinois (total to date)	**$2,806,110**
Chicago	2,134 782
Galesburg	103,344
Harrisburg	87,227
Rockford	85,348
Indiana (total to date)	**$409 478**
Indianapolis	391 570
Muncie	17 888
Iowa (total to date)	**$281 388**
Belle Plaine	875
Davenport	45,268
Iowa City	868
Ottumwa (additional)	8 518
Sioux City	120 892
Spirit Lake	2 788
Maine (total to date)	**$110 482**
Andover	5,403
Androscoggin County	48 858
Brunswick	18 815
Kennebunk	24,004
Sanford	84,084
Massachusetts (total to date)	**$300**
Michigan (total to date)	**$833 610**
Sandusky	7 300
Minnesota (total to date)	**$202 813**
Becker County	13 583
Beltrami County	33 825
Clearwater County	28 295
Hubbard County	40 888
Itasca County	8 705
Koochiching County	27 180
Mahnomen County	8 785
Marshall	18,028
St. Louis County	8 770
Mississippi (total to date)	**$807,483**
Montana (total to date)	**$833,339**
Anaconda	2 288
Baker	3 505
Billings	54 729
Bozeman	7 488
Butte	73 731
Columbus	383
Deer Lodge	7 292
Ekalaka	1 773
Glasgow	1 530
Glendive	2 825
Hardin	5 148
Harlowtown	2,448
Helena	3 360
Lewistown	8 850
Libby	3 308
Livingston	9,172
Malta	3,388
Miles City	3,853
Polson	716
Scobey	378
Sheridan	4 244
Nebraska (total to date)	**$817,208**
Alliance	14 886
Omaha	803 615
Nevada (total to date)	**$1,883**
New Hampshire (total to date)	**$43,000**
Nashua	43 000
New Jersey (total to date)	**$173,030**
New Mexico (total to date)	**$10,810**
New York (total to date)	**$6,380,140**
Albany (additional)	5 941
Croton-on-Hudson	2 289,742
Newburgh (additional)	15 080
Niagara Falls	118,676
Rochester	288 138
Utica	204 277
North Carolina (total to date)	**$582 162**
Elizabeth City	187
Goldsboro	28,823
Hendersonville	124 828
Hickory	53 068
Lenoir	100 183
Lumberton	58 055
New Bern	23 624
Shelby	87 068
Wilmington	105 888
North Dakota (total to date)	**$40,008**
Ohio (total to date)	**$637 581**
Marion	87,285
Woodsfield	3,128
Youngstown	308 068
Oklahoma (total to date)	**$80 870**
Oklahoma City	85 878
Oregon (total to date)	**$148 000**
Pennsylvania (total to date)	**$87,543**
Oil City	29,237
Philadelphia	5 243
South Dakota (total to date)	**$170,846**
Aberdeen	48,135
Deadwood	67,518
Watertown	44,310
South Carolina (total to date)	**$284,899**
Tennessee (total to date)	**$940 035**
Chattanooga	215,246
Jamestown	10 486
Nashville (additional)	8 570
Virginia (total to date)	**$833,301**
Richmond	129 387
Washington (total to date)	**$82,885**
Deer Park	23 888
West Virginia (total to date)	**$2 315,080**
Camp Dawson	24,200
Wisconsin (total to date)	**$37,087**
Appleton	1,504
Superior	28 839
Waukesha	27 884
Wyoming (total to date)	**$83,220**
Lander	1 028
Newcastle	3 827
Sheridan	53 618
Worland	1 080
National Total	**$25 800,811**

Long Live the King

Washington flier gathers two more light seaplane records, now holds seven. U. S. leads again.

THE NAA's campaign to get America more FAI international records than anyone else, last month became even more of a King + Acronca-against-the-World proposition that it had been previously.

Last June when the United States needed only a record or two to pass France and gain the lead for the first time in eight years, it was Benjamin King amateur flier from Washington, D. C. who came through with three light seaplane records set in a float-equipped C-3 Aeronca. Then, as America moved out to a nice lead, King turned in two records for the very lightest seaplane category, set in a float-equipped C-2 Aeronca. In early September the United States was some ten marks ahead of the field. Then a pair of Polish balloonists went berserk at the Gordon Bennett races and took six points from the American total, and a couple of Italian gentlemen took over most of the speed-load-distance marks Tomlinson had set last spring with the Douglas DC-1. The shocking result was to put America once more back in second place. Hughes and McGinnis, helped close the gap. Finally we were once more just a single record behind the French.

On Dec. 11, as a preliminary to the Miami Air Maneuvers, King stepped to the plate for a bit of pinch hitting. This time he sought the speed records for 62 and 310 miles for single seated seaplanes weighing less than 551 lb. empty. For hours the diminutive plane droned around the course. By evening King had his marks, 70.48 m.p.h. for the longer distance, 80.93 m.p.h. for the shorter. That made it: U. S. 39, France 38, Italy 28 and so on.

Financial

Reports from Kinner, Imperial Airways, Consolidated Aircraft

REDUCTION in his company's net operating loss from $175,000 in 1934 to approximately $60,000 in 1935 was forecast last month by Robert Porter, president of Kinner Airplane and Motor Corp. Sales in the first eleven months of this year totalled $241,000 against $225,000 in the like 1934 period. Orders on hand stand at about $150,000. Current assets at the beginning of the year were $225,000, current liabilities $107,500. President Porter reported the company's present position substantially the same. The firm has filed with SEC and state authorities for approval of a new stock issue of 185,844 shares to provide $92,922 of new working capital.

The recently issued annual report of the Imperial Airways reveals that during the year ended March 31, 1935, profits of the company increased to £133,769 compared with £78,871 for 1933-34 and £52,894 for 1932-33. The number of passengers carried on regular services increased from 50,945 in 1933-34 to 55,748 in 1934-35, total traffic ton-miles, including passenger, mail and freight, increased from 2,733,603 to 3,511,528 and miles flown increased from 2,354,176 to 2,885,761, according to the report.

The San Francisco *News* has reported total sales of the Consolidated Aircraft Co. for the quarter ended in September to have been $95,000 with a net profit realized of approximately $25,000, bringing the total net profit for the first nine months of 1935 to $301,000, 52 cents a share.

Work in Progress

Reports of current activity at Lockheed, Fairchild, Stinson, Sikorsky, and Taylor

LOCKHEED AIRCRAFT has announced delivery of three new Model 10E Electras to Pan American. Powered with Pratt & Whitney Wasp Sr. Type S3H1 engines (rated at 550 hp. for take-off) the 10E is designed for a cruising speed of 205 m.p.h. at 9,600 ft. with a load of ten passengers, 420 lb. of mail, baggage and express. Equipped with a new landing gear that completely retracts the wheels in 7½ seconds, Hamilton constant speed propellers, and automatic mixture controls, the new model has been granted Approved Type Certificate No. 595. Lockheed has also announced the purchase of four 10A Electras by LOT, the Polish airline which has acquired several Douglas DC-2s. One of the LOT Electras was delivered early last month, the remaining three were scheduled to follow soon after.

Approved Type Certificate No. 587 was issued last month to the Fairchild high speed amphibian (AVIATION, May, 1935). Six of these ships which cruise at 155 m.p.h. and are powered with the P&W Hornet have been ordered by Pan American. Another has already been delivered to Richard Archbold for use in New Guinea. It carries two pilots, eight passengers and 1,000 lb. of mail or express. Other Fairchild items: The first of the Fairchild five-place air sedans to be completed has been delivered to the Superior Oil Company of Houston, Texas. Known as the Fairchild 45 this model is to be powered with a 325 hp. Wright Cyclone and will have a cruising speed of over 160 m.p.h. at 5,250 ft. The Fairchild Ranger 24 exhibited in October at the Milan Show was the fourth Fairchild which had been delivered during the year to Fairchild's Italian dealer. It has already been sold.

A recent bulletin from the Sikorsky plant lists one S42A just delivered to Pan American Airways, another due for delivery late in December, and five more under construction for the same company. Inter-Island Airways has just received the first of the S43s, and will receive a second in the near future. Fifteen of these amphibians have been ordered so far: six by Pan American, three by Marine Airlines (N. Y.-Boston) one by KLM, several by other European airlines.

Taylor Aircraft Company has announced the completion Dec. 10 of the 200th Cub built since Jan. 1, 1935. Two hundred units should give Taylor a record of having produced between a fifth and a fourth of the entire year's civil production for 1935.

Stinson last month featured an observance of its tenth anniversary by the christening of the 1936 Reliant by Mrs. E. A. Stinson, widow of the company's founder. During the decade the Stinson organization has produced more than 1,000 planes valued at more than $10,000,000.

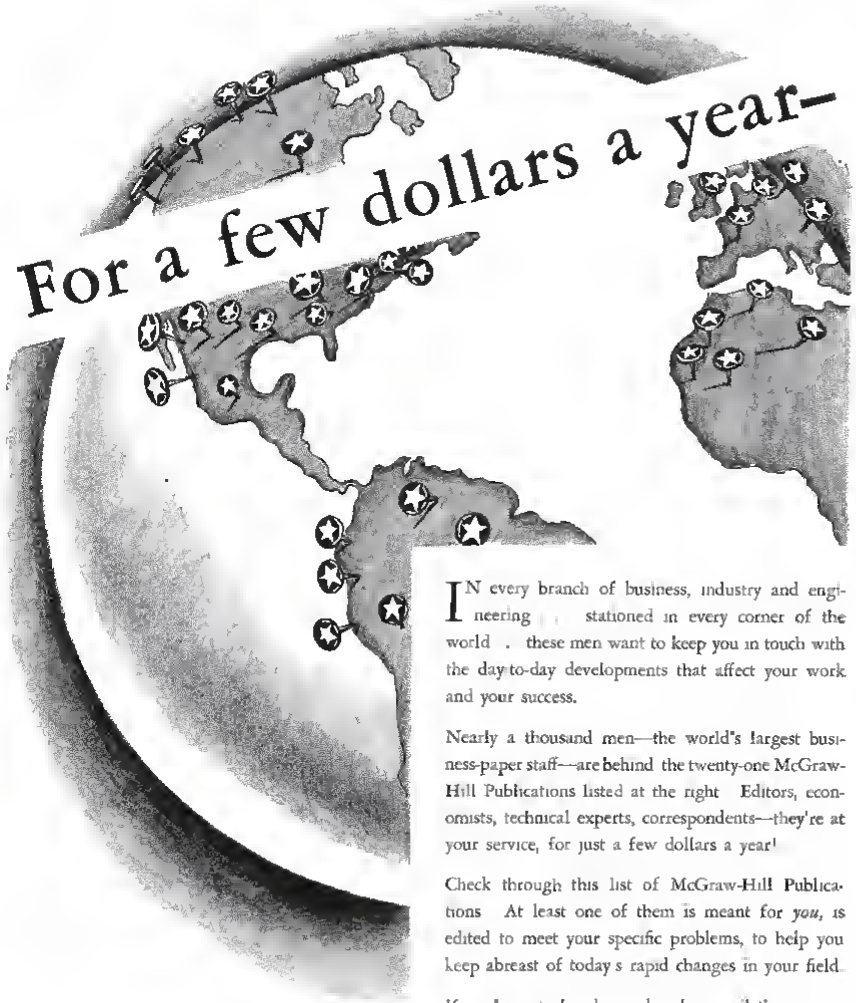
Air Corps Orders

Northrop to build 100 more attack planes, Douglas 90 bombers, Boeing 13 299s

DEC. 17, the War Department announced the award of an order for 100 ground attack planes and spares equivalent to fifteen more to the Northrop Corporation of Inglewood, Calif. Total contract price was given as $2,560,074. Northrop, which is already busy on a contract let last spring for 110 attack planes, was sole bidder at the July 24 opening for the present order.

The plane is an all-metal low wing monoplane of advanced design capable of 250 m.p.h. top speed, a cruising speed of 220 m.p.h., a service ceiling of 20,000 ft. It is powered with the Pratt and Whitney Twin Row Wasp Jr. Type R1530.

Four days later a second War Department announcement gave the results of the much publicized bomber competition on which bids were opened Aug. 22. To Douglas goes the lion's share, an order for 90 twin-engined ships to be powered with 850-hp. Wright Cyclones and to cost $6,498,000. Boeing receives an order for thirteen four-engined Model 299s at a price unannounced but estimated from last August's bid figures at $2,600,000.



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Schools, Services, and Airports

● ALABAMA—The MONTGOMERY Municipal Airport project which has been allotted $102,153 of WPA funds will provide a radio station, additional aprons, runways, and other improvements. . . . The State Aviation Commission has been active in obtaining leases on sites for new airports in the 50 cities that will benefit from $1,300,000 in public works funds allotted the state by the comptroller general. . . . The Donaldson Flying Service of MONTGOMERY, which was taken over by Harry King, and is now known as the King Aircraft Service, has purchased a Fairchild 22, equipped for blind flying and radio training The company also operates an approved repair station

● ARIZONA—PHOENIX dedicated Sky Harbor, its newly purchased $100,000 airport, in November. Mayor Joseph S. Jenckes and Governor B. B. Moeur addressed a crowd of 10,000, which was later entertained with an air show featuring Clarence Phoenix, in a delayed parachute jump A surprise visit by Capt. Frank Hawks, on tour for the Will Rogers Memorial Fund, added greatly to the program.

● ARKANSAS—FORT SMITH aviation enthusiasts who hoped to have the city buy the airport were disappointed when Mayor J. K. Jordan announced the city had no money available for such a purpose. Moreover, Works Progress Administration officials told them that until the field is municipally owned there is little chance of any expenditure of relief money for improvements The local Lions Club recently raised enough money by public subscription to pay the airport's $100 a month rent for a year Fort Smith's aeronautical committee is negotiating with the Kelly Trust Company, owners of the field, to find some way to utilize the city's option to buy the airport for $20,000

● CALIFORNIA — Plans are being made for construction of a $100,000 steel-frame hangar and shop, 300 by 132 ft., on the Kern County Airport, BAKERSFIELD . . . City Manager Randall M. Dorton has issued new rules for fliers using LONG BEACH Airport. . . . The mayor and city council of SAN BERNARDINO have unanimously approved plans for purchase of a 175-acre tract at the southeast corner of East Third and Pepper Streets for development into a municipal airport . . . Training in all phases of aviation is being offered at the Los Angeles Technical Institute, which opened classes late in November in LOS ANGELES, Engineering instruction will be supervised by George B. Fuller and W. A. Hammond. . . . Mayor E. C. Emmons, of TAFT, has reported to the Taft Chamber of Commerce that three airport sites as alternatives to the town's present leased field had been found. . . . Succeeding Hugh Brewster, Charles Walker of Chicago has been appointed aeronautical inspector for the San Joaquin Valley by the Bureau of Air Commerce. . . . The Orange Belt Flyers Club held a meeting in RIVERSIDE late in November The principal speaker was Joseph S. Marriott of the Department of Commerce. The club, which was organized a year ago, has 85 members . . . The FRESNO Board of Supervisors is seeking to close Tellman Avenue from Kearney Boulevard to Whites Bridge Road to permit expansion of Fresno Chandler Airport . . . $558 661 has been released by the Works Progress Administration to start improvements to SAN FRANCISCO Airport This will cover expenses for four months. . . . MERCED last month was debating the advisability of spending $3,000 of its own to qualify for a $35,000 WPA grant and $18,000 worth of lighting equipment. Improvements would include a 100 by 104 ft. hangar, an administration building, removal of power lines, and grading and oiling of the field. Fifty men would get jobs for eight months . . . A $7,000 WPA grant will enable SANTA MONICA to level the runways on Clover Field by excavating 19,385 cu. yd. of earth along the easterly 200 feet of the airport, lowering the runway by a maximum of 7 ft. The Ryan School of Aeronautics planned its second annual Student Air Show at Lindbergh Field, SAN DIEGO, for late November Ryan's chief instructor, John Fornasero, was to be in charge of the flight program, which includes formation flights, precision landings, precision spins, and bomb dropping . . . The Wing Benders, a group of 35 SAN JOSE flying enthusiasts, have elected Dr. I. W. Morgan president and Burnett Creighton vice-president. Norman Breedon, a HOLLISTER flyer with more than 300 hours, has announced he has bought the lease of the SAN JOSE Airport, and would take possession Dec. 1 . . . SANTA BARBARA is attempting to raise $90,000 for the purchase of Goleta Airport so that the city will be eligible for $125,000 in WPA funds . . . A crowd of 2,500 watched Harold West give Mary Lee Shoemake a demonstration flying lesson during the Armistice Day show at the Alhambra Airport . . . The county supervisors and the PLACERVILLE City Council have agreed to budget $1,000 each for the purchase of Placerville Airport to make it eligible for WPA funds. . . . 100 ships attended the Women's Championship Air Races at LONG BEACH Municipal Airport in November The two-day event was managed by Gladys O'Donnell, assisted by Orville Kuster. . . . The Curtiss-Wright Technical Institute of Aeronautics, GLENDALE, is granting students permission to work on their own designs instead of following the regular school design projects Carl Stryker, chief instructor of the engineering school, says that this plan is especially popular with new students . . . Two Chinese students, Miss Katherine Cheung and Walter Chan, have enrolled in the instrument flying course at Grand Central Flying School in GLENDALE. . . . The Ryan School of Aeronautics, Lindbergh Field, SAN DIEGO, is offering free membership in the San Diego Y.M.C.A. to all students who will use the Y's facilities at least five times a month . . . The Boeing School of Aeronautics celebrated its sixth anniversary in September At its inception, the school used only 11,000 sq. ft. of floor space It now has 45,000 sq. ft. at the OAKLAND Municipal Airport . . . William Warren, formerly test pilot for Kinner Airplane & Motor Corporation, will assist in instruction at Joe Plosser's Grand Central Flying School, GLENDALE.

● COLORADO—DENVER has applied to the Federal Communications Commission for permission to put its airport radio station back in service. The station was installed in 1932, but after three months the Department of Commerce requested its suspension If the application for resumption of service is accepted, the station will operate 24 hours a day.

● CONNECTICUT—H. B. Wetherell, manager and chief instructor of the HARTFORD Flying Service at Brainard Field, has taken over the hangar previously used by Interstate Airways A Fleet, a Robin and an American Eagle will be used for instruction . . . The STRATFORD Town Council has voted to order foreclosure proceedings against

the Stratford Meadows Corporation, owners of Mollison Airport. More than $14,000 is owed the city in taxes and liens for repairs. BRIDGEPORT's Common Council is meanwhile studying the advisability of buying and operating it municipally. However, Mayor Jasper McLevy, of Bridgeport, thinks that $175,000, the price being asked, is too high, the property being assessed by the City of Stratford at $91,600. Unless Mollison Airport is kept open, Bridgeport will be without an airport. Fred Moller, manager of the field, has moved his planes to NEW CANAAN.

● DISTRICT OF COLUMBIA—Removal of all telephone wires around the edge of WASHINGTON Airport has been started. Burial of the high tension lines owned by Potomac Electric Power is also in prospect.

● FLORIDA—JACKSONVILLE Airport is having new radio transmitting equipment installed for informing incoming pilots of weather conditions at the field. . . . DAYTONA BEACH dedicated a new $100,000 airport, Sholtz Field, Dec. 8. The field is named after Gov. Dave Sholtz of Florida, who spoke at the dedication ceremonies.

● GEORGIA—To foster aviation in MILLEDGEVILLE a group of aviation enthusiasts have formed a stock company under the name of Georgia Air Developments, for which they are seeking a charter. . . . WPA approval has been granted for the construction of a hangar, which will be started immediately. . . . H. G. Strachan, Jr., has filed a petition with the SAVANNAH City Council asking for the exclusive right to operate a flying school on the Savannah Airport. Southern Airways, Inc., has also filed a petition, stating that it has been operating a school there successfully for six weeks, and asking the privilege of continuing. . . . Col. Clarence Chamberlin agreed to give 10 per cent of all passenger receipts from flights he made last month from Daniel Field, AUGUSTA, to The *Chronicle's* Empty Stocking Christmas Fund. . . . Ralph Swaby, who has had experience in running a school in Illinois, is now managing COLUMBUS Airport. He is enrolling pupils on an installment plan, with payments as low as $5 a month. He is also the agent for Stinson planes.

● ILLINOIS—B. G. De Witt, of the General Air Service, CHICAGO, is the new distributor for Rearwin Airplanes within a radius of 100 miles of Chicago. . . . R. H. Snyder, manager of the Aviation Salvage Company, of Chicago, reports a marked increase in his instrument repair business. . . . HARRISBURG is planning to improve its airport by enlarging the hangar, building an administration office and constructing a new diagonal runway. . . . Chicago & Southern Airline is urging WPA work at the DECATUR Airport, so that its planes can stop there on the Chicago-St. Louis-New Orleans route.

● INDIANA—Bennett Griffin, trans-Atlantic flier, is supervising installation of blind landing equipment at INDIANAPOLIS Airport for the Bureau of Air Commerce. . . . Harry S. Wagner has been elected president of the SOUTH BEND Pilots' Club. He was formerly secretary. . . . The city administration of SOUTH BEND is still seeking to gain title to Bendix Municipal Airport, so that the field will be eligible for $390,000 in WPA funds for improvement.

● IOWA—SPENCER Airport will be lighted as soon as the work of laying the transmission line under U. S. Highway 71 is completed.

● KANSAS—W. L. Argyle is now managing the SALINA Airport, which has been inactive for two years. A rededication is planned for the near future. . . . WICHITA will spend a WPA allotment of $22,800 for grading, construction of walks and landscaping on the Municipal Airport.

● KENTUCKY—A group of LEXINGTON business men last month planned to form a company to operate a daily passenger service from Cincinnati to Chattanooga via Lexington, Middlesboro, and Knoxville. . . . Col. Paul D. Hosier, general manager and chief pilot of Lexington Air Taxi Service, Inc., and Earle McGuffey, secretary of that corporation, have been active in preliminary negotiations.

● MAINE—Harold F. Troxel, president of the PORTLAND Flying Service, will open a night ground school Jan. 7. Arthur Willey, graduate of the New England Aircraft School and the Wentworth Institute, will be the instructor. . . . Construction work on Stroudwater Field, PORTLAND, began late in November. The $41,191 WPA project will employ 236 men for two months. . . . A WPA and town fund of $79,000 has been appropriated for improvements at Bar Harbor Municipal Airport, TRENTON.

● MARYLAND—Seventy-five members of the Maryland Flying Club late in November visited the plant of the Glenn L. Martin Company at MIDDLE RIVER, as guests of Glenn L. Martin, president of the company.

SHOWPLACE

at Los Angeles is the Pan Pacific Auditorium which will house the National Pacific Aircraft and Boat Show Feb. 1-8. Douglas, Lockheed, Ryan, Vultee and Northrop are among plane manufacturers who have already signified they would be represented

● MASSACHUSETTS — BARNSTABLE has voted to buy the 68-acre Hyannis Airport and six additional acres for $23,300, provided the WPA agrees to spend at least $40,000 for improving it. In that case the available area of the field would be about doubled, with two runways 3,000 ft long and another 2,500 ft. long. . . John H Shobe has organized the Shobe Airlines, Inc., and taken over the hangar formerly occupied by Skyways at the BOSTON Municipal Airport F Arthur Hinchcliffe is vice-president and Miss Miriam Vandershice is secretary. Alfred R. Leckscheid will be charter pilot and student instructor. . . Plans for an airport in Common Pasture, NEWBURYPORT, have been completed, and the city is waiting for Federal allocation of funds to start construction.

● MICHIGAN—Students of the Lawrence Institute of Technology, DETROIT, are constructing their own gliders under the direction of Instructor C L. Bates. The Lawrence Tech Soaring Club, together with the A B C and Detroit Soaring Clubs, have their own field 30 miles west of Traverse City. Four members of the club now have licenses as a result of training last summer. . . NILES Municipal Airport will have a new $7,000 hangar, constructed by the WPA. Other improvements at the port will cost $25,000. All work is dependent on the city's acquiring title to the property, which Mayor John Ames says will be done soon. . . The WPA has allotted $8,447 for an airport and hangar on Beaver Island, near ST. JAMES. . . The State Board of Aeronautics has passed a resolution not to pay the cost of lighting MONROE Airport after Feb. 1 because neither the city nor the county have made any effort to acquire title to the field so that it would be eligible for WPA money. . . The COLDWATER Common Council has decided to apply to the WPA for $18,000 for improvement work at Legg Field. . . About 250 men have begun work on a $300,000 airport improvement project at the DETROIT City Airport. A new parking lot will be built, the field's drainage system retiled, and three fire walls installed in the main hangar. . . Howard Anthony of DOWAGIAC, has bought the assets of the International Heath Aircraft Corporation, and if a suitable building can be obtained will move the factory to that town. . . Instructor Frank Wignall reports that 21 students have enrolled in the evening ground school at PONTIAC High School.

● MISSISSIPPI—The city of NATCHEZ and the Adams County Board of Supervisors have voted to buy the Joseph H. Sharpe Landing Field to make it eligible for a WPA appropriation of $55,000. An additional project, pending approval, would increase the allotment to $91,000, and provide for flood lighting, a hangar, runways, and a cottage for a caretaker. . . OXFORD will name its new airport Dean Faulkner Memorial Field. The WPA has allotted $67,500 for the erection of hangars and the installation of lights. . . Work on an $18,000 new airport, near WAYNESBORO, will start as soon as certain land is acquired from the Federal Land Bank. . . Al Key, the elder of the Key Brothers, visited COSINTH in November in his capacity of district adviser to the Bureau of Air Commerce. While there he approved the prospective site of the Alcorn County Airport.

● MISSOURI—Dr. John D. Brock of KANSAS CITY completed six years of daily flying in November. O. M. Mosier, president of the Oklahoma City Aviation Club, was his host at a luncheon and dance in Oklahoma City, which was attended by Eugene Vidal, Director of Air Commerce, Kansas City Manager H. I. McElroy and Elliott Roosevelt. . . The Aero Club of Parks Air College held a meeting late in November to open its fall drive for new members and hear a talk by Maj. C. R. Wassall, manager of the Curtiss Airport EAST ST. LOUIS Ill. . . Col. Arthur C. Goebel gave an exhibition of stunt flying, sky writing and two-way radio communication over the KANSAS CITY Airport late in November.

● MONTANA—HELENA held a celebration late in November to signalize completion of radio beacon installation on the Northern Transcontinental Airway from Chicago to Seattle. The last beacon was turned on in the presence of city and state aviation officials. Director of Air Commerce Eugene Vidal, and officials of Northwest Airlines, Inc. The celebration known as "The Golden Light," fell just a half century after the driving of the last spike in the transcontinental railroad. . . Steps are being taken toward lighting the National Parks Airways route to GREAT FALLS.

● NEBRASKA—GRAND ISLAND has purchased 640 acres of land at a price of $25,600 for use as a municipal airport. WPA has allotted $100,000 for improvements. . . OMAHA Airport has secured $174,550 from the WPA for improvements which will include a new 3,800 ft. runway 200 ft. wide, resurfacing and extension of the three present runways and installation of a new runway lighting system. The administration building will have a glass-enclosed control tower.

● NEW HAMPSHIRE—The Emanon Flying Club has been organized at CONCORD with thirteen members. There will be ground school instruction this winter, and the members plan to purchase a plane next June. Tentative officers are: Lloyd Heoderson, president, Frank York, vice-president; J. Perry, secretary; and D. Hargen, treasurer. . . Ten men have started WPA improvements at CONWAY Airport, and the force will be increased to 30 as soon as possible.

● NEW JERSEY—The New Jersey State Aviation Commission planned a meeting in ATLANTIC CITY Dec. 17 to commemorate the first powered airplane flight by the Wright brothers at Kitty Hawk in 1903. . . NEWARK Airport will have a new $900,000 hangar, 1,035x150 ft. It will be used by United Airlines, American Airlines, and TWA. . . Since JERSEY CITY Airport is to become the site for a stadium, Eddie A. Schneider will move his flying school to Floyd Bennett Field, N. Y. Bruce Huppert will take his plane to Atlantic City Airport, and Robert Hurley, Jersey City's flying milkman will hangar his plane at Newark.

● NEW YORK—The Will Rogers and Wiley Post Memorial Airport, Inc., at NORTH ELBA, has received a charter from the state. . . The CHAPPAQUA Board of Supervisors has designated a tract of land near VALHALLA for a central Westchester County airport. Acquisition of the land has been delayed until the WPA allocates $668,000 for construction work. CROTON POINT is still fighting to have the airport there, where the county already owns land. BUFFALO's Common Council legislative committee has voted approval of government installation of blind landing equipment at Buffalo Airport. Although the Department of Commerce recommended and the Aero Club of Buffalo endorsed, moving some buildings on the field for the use of the beam, installation will go ahead with the buildings where they are. . . Late in November HORNELL voted to buy Hornell Airport for $7,500. In December the WPA allotted $80,000 for modern equipment and construction of 100 ft. concrete runways. Work will start in the spring. . . The WPA has granted $4,500 for improvements to the NEW HACKENSACK Airport. . . MALONE is considering raising $20,000 for the purchase of land for an airport. The WPA has allotted $100,000 for its construction, but this cannot be used until the city owns the site. . . 150 business men and women have gone on record in favor of continued development of the Triple Cities Airport, WEST ENDICOTT-JAMESTOWN has started work on a new 218 acre airport, to cost more than $390,700. . . SCHENECTADY County Airport has received $60,000 from the WPA. Improvements will include grading, oiling a 100x3,000 ft. strip in each of the four runways, installation of a 100 ft. concrete circle at the runway junction, and extension of the concrete apron.

● NORTH CAROLINA—Mayor D G Stutz, of SOUTHERN PINES, has been named chairman of a committee to administer Knollwood Airport for a year. Richard Tufts, of Pinehurst, is secretary; Howard Burns, of Southern Pines, treasurer. The committee will supervise WPA improvements now in progress. RALEIGH Municipal Airport will have a new brick administration building, to cost $12,500. WINSTON-SALEM's Miller Airport will have longer runways, and several additional usable acres as a result of a $70,000 WPA appropriation. Martin Jensen, ocean flyer, will manage CHARLOTTE Airport. He will be assisted by Johnny Crowell.

● OHIO—YOUNGSTOWN, WARREN, SHARON, and NILES are cooperating in an effort to establish a 1 000 acre district airport near Vienna. The Bureau of Air Commerce has called the LANSDOWNE airport site Youngstown "entirely inadequate" for commercial operation. The WPA had allotted $390 000 for improvements there, subject to state approval.

● OKLAHOMA—The TULSA unit of the Women's National Aeronautical Association has completed furnishing their clubroom in the administration building at Tulsa Municipal Airport. Officers of the Tulsa unit: Mrs. Joe T. Trimble, president; Mrs A M Alcorn, vice-president; Mrs W S Collier, secretary and Mrs E. R Rose, treasurer. The OKLAHOMA CITY Air Terminal plans to install floodlighting on its runways after Jan I, according to Terminal Manager Bleakley. Runways are now being extended and a new drainage system installed. TULSA Municipal Airport is awaiting approval from Washington to go ahead with construction of two new asphalt runways, 2,500 and 3 000 ft. long, and a I 500 ft addition to the present runway. Extensive grading work will also be done.

● OREGON—Les Meadows of the PORTLAND Flying Service went to Chicago in December to take delivery of a new Waco. A new Cessna four-place cabin plane has been bought by Jerry H Wildman of Willamette Flying Service, SWAN ISLAND Airport. SILVERTON American Legion Field will have three new runways as a result of a $2,510 WPA project. The state and the city of PORTLAND are sponsoring a school to train aircraft workmen. Classes are held at the Commercial Aircraft Company School at Swan Island Airport under the direction of Vern St John.

● PENNSYLVANIA—A class in aviation sponsored by the SPRINGFIELD Aviation Club, has been opened at the Springfield High School. Instructor Walter M Appleby. The WPA will spend $4 223 438 on improvements at the PHILADELPHIA Airport, which will include raising its average level by 4½ ft. The PITTSBURGH-ALLEGHANY County Airport will have two new hangars, to be built by the WPA at a cost of $340 000. To make the field eligible for $200,000 from the WPA, the ALLENTOWN City Council has acquired title to the Allentown Airport. At the same time, the council leased the fie'd for $1 a year to the Allentown Airport Corporation. ALLEGHANY County Commissioners have taken legal steps against the Bell Telephone Company and the Duquesne Light Company to remove overhead wire hazards at Pittsburgh-Alleghany Airport.

● SOUTH CAROLINA—The Coast Guard has been allotted an additional $72 185 by the PWA for the construction of an air station at CHARLESTON bringing the total allotment up to $320,185. COLUMBIA has cancelled a 99-year lease with the Curtiss-Wright Flying Service for operation of Columbia Airport. The city charges that the company failed to maintain service and delayed the release of $5,000 in WPA funds granted for use in draining the field. ANDERSON Airport is being graded and improved as a $9 000 WPA project.

● SOUTH DAKOTA—A new airport is being constructed at MITCHELL with $24,000 of WPA funds. The field will have an 80x60 ft. hangar. Runways are being leveled and a machine shop and administration building built at HURON Airport.

● TENNESSEE—CHATTANOOGA Municipal Airport will spend $221,865 for grading, repairing and remodeling the present administration building, and building a new hangar. The Sportsman's Flying Club has been organized in PARIS. Members expect to buy a new Taylor Cub in the near future. CHATTANOOGA held an air show in December featuring Maj. Dick Granere, Canadian war ace and stunt pilot.

● TEXAS—Edward F (Doc) Booth and Hal Henning are opening a repair station at Love Field, DALLAS, under the name Booth Henning Inc. Frank M Say, formerly with Chicago & Southern Airlines, will be in charge of the instrument, propeller and accessory departments. The WPA has allocated $16 000 for a new airport at DALHART. HOUSTON Airport will have a new steel hangar, 120x80 ft. It will cost $11 000, and is part of the field's $26 000 WPA improvement program.

● UTAH—Salt Lake Airport at SALT LAKE CITY is to have 416 000 sq.yd of oil mulch laid to prevent dust, and a concrete apron will be built in front of the administration building.

● VERMONT—MIDDLEBURY College will offer a course in aeronautical theory and practice during the second semester. Instructor William E Hinton, a graduate of Rutgers Engineering School. Actual flying will be under the auspices of the recently organized student flying club. BURLINGTON is now equipped with a revolving beacon light.

● VIRGINIA—Clayton Lemon, operator of the ROANOKE Municipal Airport, and Norwood Carper, Jr, plan to carry passengers once a week from CANNADAY Field to PULASKI where Lemon will also give weekly instruction. A WPA project for landscaping and construction of a building for the comfort and convenience of those using PETERSBURG'S emergency landing field was approved late in November by City Manager John P Broome.

● WASHINGTON—OLYMPIA Airport has received $85,507 from the WPA for widening runways, a lighting system and a 100x80 ft hangar. SEATTLE is planning an airport program, which will offer separate facilities for sea and land planes. The seaplane base would be on the shores of Lake Washington, immediately north of the Lesch Park pier. SPOKANE is considering the advisability of erecting a municipal hangar at Felts Field. If plans should go through, Northwest Airlines would supply the material, and government labor would be used. The airline would rent the hangar from the city, and provide for maintenance.

● WEST VIRGINIA—Harper Field, ELKINS, where Dudley Reed is conducting a flying school, will have an administration building, a new hangar, field lighting, and extension of runways under the WPA airport program. Wertz Field, CHARLESTON, has a new flying club, with H H Burton, Harry Belt, M A Shaeffer and Cole Johnson as charter members. An aviation school at Charleston, under the name of Mountain State Air Service, Inc, was granted a charter in December. Incorporators: H H Stark, B E. McCown, and H W. McCown.

● WYOMING—Construction of a building to house blind landing equipment has begun at CHEYENNE Airport. It is one of the first such installations west of the Alleghanies. Delegates of three western districts of the National Association of State Aviation Officials will convene at CHEYENNE Jan. 19, 20 and 21. ROCK SPRINGS has applied for $190 000 in WPA funds for lighting the field, grading work, and oiling the two principal runways.

Aviation People

● At a meeting in Washington, Dec. 9, the Aeronautical Chamber of Commerce elected LEIGHTON W. ROGERS president to succeed THOMAS A. MORGAN, who resigned due to business reasons after holding office for nearly three years. Mr. Rogers entered the United States Foreign Office in 1923, becoming Chief of the Aeronautical Division of Foreign and Domestic Commerce five years later. June 30, 1933, he resigned that post to become executive vice-president of the Aeronautical Chamber, a position which he continued to fill until his recent election to the presidency.

● JOHN B. WALKER of Chicago has been placed in charge of the entire traffic department of TWA with the title of General Traffic Manager. With a wide experience in advertising and traffic work including four years as general traffic manager of the Greyhound Bus Lines, Mr. Walker came to TWA from the Beaumont and Hohman Advertising Agency of Chicago of which he was vice-president.

● Hubbard Gold Medals, the highest award of the National Geographic Society for geographic achievement, were presented by GENERAL JOHN J. PERSHING, a trustee of the society, to CAPTAIN ALBERT W. STEVENS and to CAPTAIN ORVIL A. ANDERSON, commander and pilot, respectively, of the record-breaking stratosphere balloon "Explorer II," at a special ceremony in Constitution Hall, Philadelphia, Dec. 11.

● After 28 days had passed in fruitless search since the disappearance of SIR CHARLES KINGSFORD-SMITH in a Malayan typhoon, PRIME MINISTER LYONS last month sorrowfully told the Australian Parliament that that great flier must be regarded as dead. Sir Charles was born in Brisbane in 1897. At eighteen he enlisted. Soon a veteran of service in Egypt and at Gallipoli, he transferred to the Royal Flying Corps. Himself shot down after being credited with six victories, he was invalided to England, then retired with the rank of Captain. After much flying in Australia he began building the long list of record flights which left him at his death almost untravalled. In 1927 he made a record flight around Australia, in 1928 a flight from California to Australia via Honolulu, then across to New Zealand. The next year he set a mark of thirteen days between Australia and England. In 1930 he negotiated the second western crossing of the North Atlantic and lowered the England to Australia record, setting a mark which he was to lower himself within the next two years. Then in 1934 he made the first crossing from Australia to California once more, stopping at Hawaii. He met death in another gallant attempt to break the London to Brisbane record, an attempt he had announced as his final pioneering effort.

Leighton W. Rogers

John B. Walker

Capt. A. W. Stevens

Sir Charles Kingsford-Smith

● United Airlines has appointed ROBERT NEFF, formerly with the *Wall Street Journal*, as its public relations representative for the New York district, to succeed FRANK CURTIS. Mr. Curtis has resigned to open a publicity office of his own in that city.

● TWA has announced the appointment of ROLAND PALMEDO, HAROLD E. TALBOTT, JR., and MARCO HELLMAN as directors, to succeed JOHN PRATT, FRED G. DONNER, and H. M. HOGAN, who had represented General Motors' interest in the company. Mr. Palmedo, who resigned as a director of Lehman Brothers, Air Associates, Aviation Capital, and other companies identified with the aviation industry to take his new position, is himself a pilot and has long been active in aeronautical finance. Lehman Brothers and Atlas Corporation recently acquired control of TWA from General Motors by an outright purchase of all its TWA holdings.

● BURDETTE S. WRIGHT has been elected vice-president of the Curtiss Aeroplane & Motor Company, in charge of the Buffalo plant, to succeed RALPH S. DAMON, who, after thirteen years with the Curtiss Company, is to join American Airlines as vice-president. Mr. Wright, who served ten years with the Army Air Service before entering Curtiss employ eight years ago, received the American Distinguished Service Cross, the French Croix de Guerre, the Belgian Order of the Crown, and a personal citation from GENERAL PERSHING. He supervised development and organization of the Army airways system in 1922, had charge of training at Kelly Field in 1925, and when he resigned in 1928 to join Curtiss was serving as chief of the information division of the office of the Chief of the Air Corps.

● EUGENE L. VIDAL has appointed JOHN S. COLLINS Chief of the Administrative Section in the Bureau of Air Commerce. Mr. Collins is a native of North Carolina, and has been in government service for 32 years, since 1928 as Assistant Chief of the Administrative Section.

● The Army Air Corps has two new Major Generals as a result of appointments made last month. The day before Christmas SECRETARY OF WAR DERN announced the promotion of BRIGADIER GENERAL OSCAR WESTOVER, who for four years had been Assistant Chief of the Air Corps and its Acting Chief for three months, to be Chief of the Air Corps. He succeeds MAJOR GENERAL BENJAMIN D. FOULOIS, who retired Dec. 21. Two days after General Westover's appointment, BRIGADIER GENERAL FRANK M. ANDREWS, com-

mander of the GHQ Air Force, was advanced to the temporary rank of Major General, thus giving the chief of the combat element of the Air Corps the same rank as the head of the training and procurement branch. Both promotions are still subject to confirmation by the Senate.

▪ WALTER E. LEES, formerly test pilot and aeronautical service engineer for Packard Motors, has joined the staff of Scintilla Magneto Co., Inc. He will specialize in the sale of that company's line of aircraft spark plugs and radio shielded harness.

• DR. WILLIAM FREDERICK DURAND, professor emeritus of mechanical engineering of Stanford University, has been awarded the John Fritz Gold Medal for 1936 for notable achievement "as authority in hydrodynamic and aerodynamic science, and its practical application, outstanding leader in research and in engineering education." The citation covers his invention of precision measuring instruments, his appointment by the President as chairman of a committee of review of airship design and construction for the U. S. Navy, his trusteeship of the Guggenheim Fund for the Promotion of Aeronautics, and his editing of a comprehensive work on aerodynamic theory in six volumes. Dr. Durand was an organizer of the National Advisory Committee for Aeronautics, past-president of The American Society of Mechanical Engineers, and has served in the Engineer Corps of the Navy. Among the many distinguished honors conferred on him are the Daniel Guggenheim Medal for 1935 and the Gold Medal of the American Society of Naval Engineers.

Side Slips

By Robert R. Osborn

PRESUMABLY because the Japanese beetle quarantine inspection has been relaxed now that colder weather is here, we see that one or two of the French "Flying Flea" Midget Planes have gotten into the country. As is usual with all light planes the pictures of it carry the captions, "This may be the future Air Flivver"—and judging by the U. P. dispatches concerning the first test flights in this country, we'd say the air flivver boys of the future are going to have their hands full—"In his third attempt today, Pangborn taxied the tiny plane to the end of the runway and 'gave it the gun.' A few seconds after it left the ground the left wing dipped sharply. Watchers thought a crash was certain, but Pangborn righted the plane and gained altitude. After landing, he said the near accident was a result of limited control over the wings, which are not equipped with ailerons or elevators as in conventional designs. Up and down movement is controlled by movement of the entire wing structure with the stick. He said he had to reach behind and control the wing with his arm when a crash was threatened, much as was done in the early flights by the Wright Brothers."

THIS month's prize for clever captions has been awarded to the Washington *Post* for the title on the picture of Wiley Post's Winnie Mae as it entered the front door of the Smithsonian Institute in Washington—"The Winnie Mae being pushed into posterity."

IN our humble opinion, Macy's, of New York, has one of the cleverest of the department store advertising departments

Their latest—full page maps in the New York papers, indicating graphically how late one may send Christmas gifts (Macy gifts, of course) by air to all parts of the United States and South America, certainly deserves honorable mention, with palms.

IT IS probable that we aren't concentrating well enough when we read the daily papers, but our present impression is that American airline officials have gone to England, English airline officials have gone to Germany, and German airline officials have come to America to discuss the possibility of cooperating on a transatlantic air service.

A New York *Times* article on the proposed transatlantic airline negotiations leaves us a bit disturbed—"At premium rates, the mail is expected to guarantee sufficient income to the operators to ignore passengers for the first year's operation."

We had always thought that the ignoring of their passengers by the railroads during boom times had been one of the greatest helps for the airplane and bus lines in building up their passenger traffic when the depression came along.

One of our pet hates is reserved for the 'uppity" official who likes to show his authority, and we've always regretted that we did not have the Joe Louis physique necessary to do something about it when some such person needed a punch in the eye. Knowing that such feelings are probably shared by most AVIATION readers, we are sure they would have enjoyed a little scene we witnessed one night on one of the Philadelphia to-New York trains: The conductor, in collecting his tickets had reached the lady about ten seats ahead of us, when we heard him say in a loud voice:

"That ticket isn't any good, lady, I'll have to collect $3.24."

"But my husband gave me the ticket and said it was all right."

"The ticket is no good. That will be $3.24."

"Please tell me why it isn't good, my husband said—"

"That will be $3.24," said the conductor again, leaning on the back of the seat and winking at the rest of the passengers—whereupon, a six-foot-two man arose from the seat back of the lady and said, "If you don't give that lady a civil answer in three seconds, I'm going to bounce your head down the aisle of this car." There was applause from the rest of the passengers and after quietly explaining to the lady why her husband was wrong, the conductor collected the rest of the tickets in that car in record time.

THE beginning of the New Year finds us in a mellow mood, extending good wishes to all friends, if any, and to all enemies, if any. To all persons who do

not fall within the above classifications —good wishes.

For Mr. Lincoln Ellsworth, and his flying partner, we wish a speedy rescue, and a successful continuation of the good work they were doing.

We even go so far as to forgive Mr. Farley his sins of omission and commission, and wish him success in all undertakings but that of continuing himself in the position of Postmaster General for another four years.

Classified Advertising

10 CENTS A WORD — $2.00 MINIMUM

Planes, Engines & Parts For Sale

Indexed—see page opposite

WACO F-3, exceptionally fine condition, never used commercially but beautifully maintained by private owner on own field, only 140 hours total time, never damaged, Jacobs engine just had the new type knuckle post installed and top overhaul, extras, $3,500 cash. Travel Air biplane, Wright 165 hp., 18 hours since engine major overhaul, licensed to May 1936 $1,200 cash; also used Fairchilds, cabin and open. Havens and Depew, Hangar C, Roosevelt Field, Mineola, N. Y. No. 1

AERONCA CABIN 1935 demonstrator, 4 mos. old like new, $1,450.00. Aircraft Service, Inc. Cleveland Airport, Cleveland, Ohio. No. 2

GREAT LAKES 2T-1A, recovered less than year ago. Forty-five minutes since complete major on engine. $1,095.00. $495.00 down. St. Louis Flying Service, Lambert Field, St. Louis, Mo. No. 3

AMERICAN EAGLE with Irte type 35-40 horse power engine with newest design heating new propeller airspeed licensed until June, a buy $450.00. Kinner 100 crankshaft with bearings $25.00. Menske Eldred Flying Service, Willoughby, Ohio. No. 4

MISCELLANEOUS EQUIPMENT. Dixie Magneto Switches, 49c; Fuel Pressure Gauges, 47c; Oil Pressure Gauges, 50c; Engine Priming Pumps, 77c; Distance Temperature Gauges, $1.98; Johns-Manville Tachometers, $5.07; Booster Magnetos, $4.95; Star Pathfinder Compasses, $12.07. Send dime (Canada 20c) for catalogue full of other bargains. Karl Ort, 607 W. Poplar St., York, Penna. No. 5

STANDARD D-25. J-5 motor; ship completely rebuilt recovered 1934 special upholstery and instrument panel, blue and red, 215 hours since motor overhaul; ship should be seen. Leech Aircraft, Inc., Armonk Village, New York. No. 6

NEW AIRPLANES $25.00 down, easy payments. 7.00x4 Air Wheels with hubs $16.00 per set. Propellers, $2.98 up. Send 25c for information. Hibbs, Fort Worth, Texas. No. 7

AERONCA C-3. Built August 1934. Winter enclosure, cabin heater. Engine majored and ship completely reconditioned at factory July 15th. $1,150.00. $595.00 down. St. Louis Flying Service, Lambert Field, St. Louis, Mo. No. 8

ATTENTION California Pilots. For Stinson R, excellent finish condition, $500 extras, red leather. Trade for bungalow, business property on coast. Sell outright. Dr. E. H. Haynie, General Delivery, San Diego, Cal. No. 9

HISSO 150, 180 and 300-360 Engines and Parts. At ridiculously low prices. These make excellent speed boat engines when converted. Write for quotation on your requirements. Karl Ort, 609 W. Poplar St., York, Penna. No. 10

GUARANTEED USED AIRPLANES. Stinsons of every model, J6-5 Commandaire, Continental Waco Cabin, Gipsy Moth, Buhl Pup. For sale or trade. Chicago Aviation Corporation, Glenview, Illinois. No. 11

BEARWINS new, used, Stinsons Waco, Leblond Inland, OX Commandaire, all licensed. General Air Service, 4500 W. 83rd St., Chicago, Ill. No. 12

OX ROBIN just relicensed. Both fabric and engine in excellent condition. Privately owned. $550.00. $200.00 down. St. Louis Flying Service, Lambert Field, St. Louis, Mo. No. 13

STINSON 1935 RELIANT. Privately owned, 100 hours since major overhaul; 72-gallon gasoline bank turn special tan leather upholstery, special black and red paint, complete lacing including pants. Landing lights. Leech Aircraft, Inc., Armonk Village, New York. No. 14

1935 STINSON RELIANT repossessed. Licensed for five. Never damaged. This is a new airplane, only 54 hours or a real bargain. Stinson 1934 Reliant repossessed. Honest 110 hours total. Special paint, leather, lights, flares, radio, controllable prop. Never damaged. Aircraft Finance Company, Glenview, Illinois. No. 15

HISSO MODEL A AND E ENGINES rebuilt in our own plant $60 up. Send for descriptive list. Complete stock of Hisso, Curtiss OX-5 and Liberty parts. Send us list of your requirements. Complete machine shop service on all types of aircraft engines. Heckmann Machine Works, 4026 W. Lake St., Chicago, Ill. No. 16

OX5 ROBIN: De Luxe Job. Recovered year ago. Shatterproof glass throughout. Electric gas gauges. 30x5 tires. Fahlin propeller. Extra motor. Licensed. $525.00. REV. ROY K. REED, Sherburn, Minn. No. 17

TAYLOR CUB. Three months old. Cannot be told from new. $1,195.00. $595.00 down. St. Louis Flying Service, Lambert Field, St. Louis, Mo. No. 18

125 H.P. KINNER BIRD. For Sale. 4-place, 260 total hours on ship and motor. Now equipped with Edo Pontoons and water rudders. 160 hours since major motor overhauled. 15 hours since ship was completely dismantled, overhauled and recovered. Mechanical condition as good as new ship, appearance far superior to factory finish. Equipment includes Airwheels, Brakes, Heywood Starter, Switlik Chute, Air Speed, turn and bank, rate of climb. Licensed to July 15, 1936 on land and sea. Insured through March, 1936. Always kept in private hangar on fresh water. Considered by many prominent pilots best BIRD ever built. $2,600.00. No trades. PS-306, Aviation, 330 West 42d Street, New York City.

SECURITY AIRSTER. Two-place side-by-side, Kinner 100. 33 hours since major overhaul on ship and engine, compass, airspeed, silver paint, ideal ship for training. Leech Aircraft, Inc., Armonk Village, New York. No. 20

FAIRCHILD 22. Warner 125 H.P. Almost new, 60 hours total, sport landing gear, wheel pants, Special paint job, Extras. PS-295, Aviation, 330 West 42d St., New York City. No. 21

TAYLOR CUB with Continental motor (new type) 3 months old, winter enclosure, compass, bank indicator, navigation lights, $1,100. Taylor Cub with Aeromarine motor, winter enclosure, bank indicator, compass $875. K. Russell Smith, 394 Wyoming Ave., Wyoming, Pa. No. 22

WARNER CESSNA. Recently completely overhauled, licensed to September 1936, four-place. Price $950.00. Pioneer Aircraft Co., Teterboro Airport, Hasbrouck Heights, New Jersey. No. 23

BELLANCA SKYROCKET. In A-1 condition. Equipped with wheel pants and radio. License just renewed. A good buy. Western Light & Telephone Company, Huron Bldg., Kansas City, Kansas. No. 24

CHALLENGER ROBIN just relicensed. $950.00. $595.00 down. St. Louis Flying Service, Lambert Field, St. Louis, Mo. No. 25

MONOPREP—Velie, just majored, wing and tail recovered, ready to fly away. Jack Ramsen, 78 Parkhurst St., Newark, N. J. No. 26

AIRPLANES, MOTORS, CRACKUPS, Parachutes. OX planes, $75 up. Complete Directory with owners price, name and address 25c postpaid. Aircraft Directory, Athens, Ohio. No. 27

WACO CUSTOM De Luxe Demonstrator: Jacobs powered, Less 100 hours, Less six months old, Like new. Beautiful finish, Many extras, Cost over $7,700. Will sacrifice for quick sale. The H. C. Robbins Company, Cleveland Airport, Cleveland, Ohio. No. 28

AMERICAN EAGLE. Kinner K-5, licensed, good condition, new tires and propeller. Sell as is or less engine. Accept light ship on trade. Bob Curry, Seymour, Indiana. No. 29

REPAIRS—CONSULTATION—SALES—SERVICE—Pesser Propeller Service, North Beach Airport, Jackson Heights, New York City. Telephones: Garden City 5768-M, HAvemeyer 4-9600. No. 30

FAIRCHILD 24. One month old. Flap model. Twenty hours total time. $4,385.00. $2,800.00 down or will take your ship in trade. St. Louis Flying Service, Lambert Field, St. Louis, Mo. No. 31

WACO F & WARNER motor used parts. Used Instruments. Good condition. Write for quotations on your needs. The H. C. Robbins Company, Cleveland Airport, Cleveland, Ohio. No. 32

TAYLOR CUB. Continental engine, just relicensed $625. Travel Air Sport Trainer Wright Gipsy engine $925. Consider late car or plane in trades. Wright Gipsy parts. Lytle, 2355 Vodeli St., Pittsburgh, Penna. No. 33

KINNER SPORTSTER perfect condition, nearly new, 136 hours. $2,000.00 cash. Glover S. Johns, Box 870, Corpus Christi, Texas. No. 34

WASP POWERED all-metal Flamingo. Just relicensed as eight place. Faces landing lights, blind flying instruments, radio, electric starter, generator, new mohair upholstery, dual controls, a high performing airplane priced to sell. Baker's Consulting Bureau, South Bend, Indiana. No. 35

CLASSIFIED ADVERTISING

10 CENTS A WORD — $2.00 MINIMUM

WACO F, Warner engine majored last spring. E-115-A Aeronca engine and parts. Two used parachutes. Two high voltage adjustable, one thirteen volt wind generator. Dead storage $5 monthly. Chicago Suburban Aviation Corp., Stinson Airport, La Grange, Ill. No. 36

OX TRAVELAIR. Licensed Oct. 1935. Full airwheels. High compression pistons. Millerized. $400.00. Elmer Parsel, Plymouth, Ohio. No. 37

January 1936 Issue

Classified Advertising INDEX

PLANES, ENGINES AND PARTS FOR SALE

Advertisements in this classification are numbered (end of last line each ad) for indexing

LYC STINSON JR SM8A reconditioned $1375. Lambert Monocoupe, rebuilt like new, $1275. J-5 Speedwing Travel Air less engine $1275. OX5 Travel Air, reconditioned, $575. OX5 Waco Ten, rebuilt like new, $575. J-5 Cessna dismantled with motor, $375. Kinner Davis driver job, like new $1000. Omaha Aircraft Brokerage Service, So. Omaha, Nebr. No. 38

CURTISS-WRIGHT SEDAN, Challenger 185, $1,325. J5 Stinson $750. J5 Cessna, Kinner Eagle, front exhaust, steel prop, $925, also side exhaust $725. OX Eaglerock $352. All licensed. Oxmotor $15. G. O. Imm, Fergus Falls, Minn. No. 39

FOR SALE OR TRADE: Fairchild 22, OK throughout $1,250; recently reconditioned Waco F $1,300, Porterfield, like new, $1,400, Ryan J5, just completely recovered $1,450, unflown Axelson motor 150 hp. $500. Challenger Motor Parts. BG Spark Plugs factory reconditioned 55 per each. Aviation Service Company Inc., P. O. Box 32, Hartford, Conn. No. 40

STINSON S. Black and Silver, Leather upholstery—New Scott Airwheels; Bank and turn, $1,750. Other ships for sale. 24-hour Charter Service. Approved Repair Station No. 47. Eastern Aeronautical Corp. Airport, Newark, N. J. No. 41

TRI-MOTOR STINSON, Model SM6000 B Mail. Fully equipped for night flying, including radio. Plane and motors in good condition. Price, $2,000. Stinson Lycoming SM8A in good condition, Standard equipment including motor driven generator, battery, electric starter and lights. Price, $1,200. Simpson Held, No. 5 Hangar, Floyd Bennett Field, B'klyn, N. Y. No. 42

THE FLYING FLEA—Authentic plans and instructions for building and flying this airplane $4.95. Personal engineering service included. Continental Airways, Hasbrouck Heights, N. J. No. 43

1935 AERONCA. Excellent condition, cannot be told from new. Navigation lights, larger airwheels, dual gas throttles, better. Photograph upon request, owner sell to settle estate, can finance, $1,350.00. John Ablum, Sunbury Airport, Sunbury, Pa. No. 44

FAIRCHILD 14. Warner 125, two-place, Heywood starter, ship completely reconditioned, wings recovered, 75 hours since major, black and red. Leech Aircraft, Inc., Armonk Village, New York. No. 45

STEEL HEATH Fuselage and One Set Wings $25.00. E. R. Schaeffer, Linton, N. D. No. 46

FAIRCHILD 22, Wright Gipsy; 198 hours total time, blind flying equipment, duals; many extras, relicensed for another year and in first class condition. A real bargain at $1,150.00 cash. H. S. Mermondale, 237 W. Magnolia Ave., San Antonio, Texas. No. 47

PARTS for 1820-F Cyclone, Wasp and Hornet motors. Cylinders, crankcases, pistons, etc. New Wasp exhaust valves $5. Wanted: Set of Wasp D cylinders. Crawford Airplane Supply Company, 550 Washington Blvd., Venice, California. No. 48

WACO F5—Jacobs powered—lace type engine—70 hours—special paint—priced for quick sale. FS 311, Aviation, 330 West 42d St., New York City. No. 49

ENGINES AND PARTS for sale. Liberty 400 hp., Hispano E 180 hp., Packard 880 hp. The Vimalert Company, Ltd., 841 Garfield Ave., Jersey City, N. J. No. 50

OFFERED FOR SALE, privately owned Jacobs powered Waco F-3—special paint job—cockpit cowl. Special leather upholstery—total time 139 hrs. No time since top overhaul. FS-309, Aviation, 330 West 42d St., New York City. No. 51

SIOUX VALVE FACER—DeVilbiss Spray Gun with Pressure Tank and Cups—Engine Overhaul Stands—Overhaul Parts Racks—Toledo Counter Scales—Wright Overhaul Tools—Lycoming Overhaul Tools—Pioneer Manometer—New Engine Parts 75 off list—Used 90 off—Supplies and Accessories at closeout prices. Pontiac Aircraft Company, Pontiac, Michigan. No. 52

WACO F2. Powered by Continental A70. No time since major overhaul. Aeroplane and Engine. Rubbed finish. Steel Prop. Chromium plated wire, etc. FS-310, Aviation, 330 West 42d St., New York City. No. 53

FLY ALL WINTER in cabin ships with heaters for as low as $3.50 hour solo, $5.50 dual. Do you want to own your own airplane? Are you starting a club? Let us prove we can help you! Dealers wanted. Come out to Edwards Flying Service, 30 minutes from Grand Central by subway to Flushing, Long Island Airport. Phone Independence 3-4843. No. 54

WACO F, Kinner B5. Completely recovered. Engine overhauled this summer. Excellent condition. High gloss finish. FS-311, Aviation, 330 West 42d St., New York City. No. 55

Products

Parachutes

RUSSELL PARACHUTE—cotton—just repacked—perfect condition. $50 cash or C.O.D. Money refunded if chute returned within ten days. R. R. Bray, Fargo, N. Dak.

Radio

SEVERAL USED TRANSMITTERS complete with accessories at bargain values. Also a number of direct and remote control receivers. Write for particulars. Aeronautical Radio Co., Mineola, L. I., New York.

Services

Repairing

WARNER. Broken rocker arm castings repaired and resoldered. $12.50 per head. Pontiac Flying Service, St. Elmo, Ill.

(Continued on page 70)

Additional Advertising of Planes, Engines and Parts, Services, Wanted and Employment Opportunities—See Page 70

Copy for Classified Advertisements in the February Issue Required by January 20th

Classified Advertising

Continued from page 69

Services

Repairing

A WELCOME ARRIVAL. Major repairs on time payments. Approved repair station No 263. Hadley Aircraft, Inc., Hadley Airport, New Brunswick, N. J.

Sales

AUTHORIZED SALES AND SERVICE. Wright-Lycoming Continental, Pratt & Whitney. Wire, Write, Phone for Prices. Export Sales and Service. All type Engines and Parts. Engine Air Service, Inc., Roosevelt Field, Garden City, N. Y.

Wanted

TRAVEL AIR C-4000, fuselage, rudder, fin, covered or uncovered all struts. Must be in good condition. Also Kinner B-5 and Lambert ninety engines, any condition. Serv-Air, Inc., Raleigh, North Carolina.

USED AIRCRAFT INSTRUMENTS wanted. Gyro-horizon. Directional gyro. Rate of climb. Turn and bank. Aircraft generators and starters. Lincoln Airplane and Flying School, 2415 "O" St., Lincoln, Nebr.

Position Wanted

PILOT—Charter Member Flying Jackass Club of Boeing School. 600 hrs. Blind flight instructor. 10 years' experience. Good record and appearance. Will fly for daily hamburger. P W 307, Aviation.

Positions Vacant

EXPERIENCED airline engine and airplane mechanics wanted. No floaters need apply. P 388 Aviation, 330 W. 42nd St., New York City.

WANTED
Engineering Executive

An experienced executive engineer is required by a large airplane company located in the eastern states and building a wide variety of types. He is to be responsible for organizing and following the work of the engineering department, and will be the point of contact between it and the manufacturing personnel and also with the customer. He must have had similar experience and a good record. Good health and willingness to work hard are essential. This position provides a good salary and an excellent opportunity for the right man. Each applicant should apply by letter giving age, education and experience. A photograph is desirable. Personal interviews will be arranged with those whose applications warrant further consideration. All applications will be considered confidential.

P 400, Aviation
330 West 42d St., New York City

Professional Services

Edward P. Warner
Consultant in Engineering and in Policy
122 East 42nd Street
New York, N. Y.

Planes, Engines and Parts

PRODUCTS—SERVICES

ERICKSON & REMMERT, Inc.
WACO
SALES — SERVICE
Govt. Approved Flying School • Govt. Approved Repair Station • Charter Service • Storage
USED PLANES
Hangar 6, Floyd Bennett Field, Brooklyn, N. Y.
Telephone: Nightingale 4-0111

ENGINE BROKERS CO.
WRIGHT & PRATT WHITNEY ENGINES AND PARTS
Want Warners & Kinners or Parts
ROOSEVELT FIELD, N. Y.

YOUR AIRCRAFT INSTRUMENTS
are the eyes of your airplane
RAY SNYDER, in his new catalogue, offers a free service for a short time, you can't afford to miss. Write for a copy today! It also contains reconditioned engine parts, instruments and accessories. *High quality—Reasonable Prices—Prompt Service*
SNYDER AIRCRAFT COMPANY
(Formerly Aviation Salvage Co.)
6111 So. Menard Ave. — CHICAGO, ILL.

SUNDORPH AERONAUTICAL CORP.


DISTRIBUTOR
INSTRUMENT FLYING INSTRUCTION
CLEVELAND AIRPORT, CLEVELAND, OHIO

Stinson "U" Tri Motor	$5 000
Fairchild 71 Wasp D special photographic ship U S Army specifications	$2 000
Ford Trimotor J6D's	$4 000
Lockheed Air Express	$3 000
Monocoupe D145	$3 000
Others including Waco, Travelaire, Bird, etc.	

HOEY AIR SERVICES
Hangar No. 3, Floyd Bennett Field, Brooklyn, N. Y.
Telephone: Nightingale 4-1600

Frank Ambrose, Inc.
Dealers and Exporters
Airplanes, Engines & Supplies
MUNICIPAL AIRPORT NO. 2
JACKSON HEIGHTS, NEW YORK CITY

NEW
WRIGHT GIPSY
AND
AMERICAN CIRRUS
ENGINES AND PARTS
R. J. WENGER
MENASCO MANUFACTURING CO.
6714 McKinley Ave., Los Angeles, Calif.

EDWARDS FLYING SERVICE
Low Wing, High Wing, Land and Sea Planes.
AERONCA
Let us tell you how to get one. Dealers Wanted.
DISTRIBUTOR: Metropolitan New York, New Jersey, Westchester and Long Island.
Telephone Independence 3-1612
Flushing Airport, Flushing, L. I.

NEW ADVERTISEMENTS
must be received by the 20th of the month to appear in the issue out the following month.
Address copy to
The Departmental Advertising Staff
AVIATION
330 W. 42nd St., New York City

A New and Modern Service . . .

for buyers and sellers of used Planes, Engines, Parts and associated Products and Services.

Attractive, Easy to Read, Convenient to Use, Saves Time, Costs Less

The Need

The increasing use of airplanes developed a situation akin to that in the automobile field. It requires the disposal of a constantly increasing number of used planes and a corresponding volume of engines, parts, accessories—in fact every kind of aeronautical equipment.

The Market

The selling of used planes as compared with used automobiles differs greatly in one respect. Used cars are sold almost entirely in a local market; used planes can—and must—seek a national market. Therefore a national business paper of the industry—AVIATION—becomes the logical medium for offering used planes for sale.

The Service

The advertising of used planes, engines, parts, etc. naturally finds its place in the classified advertising columns of a business paper along with other advertising of services offered or wanted and the hundreds of other business wants of subscribers. However the old forms of classified advertising are not practical for any volume of this advertising as it is now developing in the field of aviation.

The NEW Service

AVIATION—as the oldest American aircraft publication serving the industry—has therefore developed a new form of classified advertising especially suited to the requirements of offering used planes in a national market. It is attractive, easy to read and through the use of a newly developed plan of numbered advertisements and indexing the most convenient service ever offered for the use of both buyers and sellers.

Indexing

The indexing of planes for sale, of engines, parts, accessories and special services offered, of trade or wanted propositions, is in itself a time saving convenience that will find quick appreciation among prospective buyers and react to the benefit of advertisers accordingly.

Lower Cost

Even with the greatly improved form of this New Classified Advertising in AVIATION advertisers are offered the further benefit of rate reductions that will materially lower the cost. First insertions will be at the existing rate of 10 cents a word, minimum charge $2.00 an insertion. BUT—if additional insertions are required to locate buyers the following rates apply:

Second insertions	8 cents a word
Third insertions	8 cents a word
Fourth insertions	7½ cents a word

YOU can use this New Classified Advertising to good purpose to reach buyers or sellers among the close-to-16,000 other readers of AVIATION, for the items you have for sale or that you want.

FEBRUARY ISSUE COPY REQUIRED JANUARY 20TH

AVIATION SCHOOLS

You learn more here because there's more here about which to learn

School is owned and operated by Roosevelt Field, Inc., (paid in capital over $5,000,000), also operators of famous Roosevelt Field—America's Largest and Busiest Civil Airport.

Over 50 buildings, housing some 200 airplanes and 50 operators engaged in various aeronautical pursuits, and some 500 acres of developed flying area comprise this vast airport and provide facilities and an atmosphere not found in any other school.

School established eight years with proven record of over 35,000 safe individual flying hours and hundreds of successful flying and mechanic graduates.

Separate training field for flight students, surrounding territory safe and ideal for flying and flight instruction.

Finest practical mechanical training given on fine engines and licensed airplanes in government approved repair depot No. 181 of the school.

Location of Eastern Regional Office of Bureau of Air Commerce in school hangar brings wealth of interesting airplanes of all types and famous aviation personalities to school field.

INVESTIGATE BEFORE YOU INVEST.

AVIATION TRAINING

Roosevelt Aviation School is the only Government Approved Transport and Mechanics school in the East.

Here you can qualify for any flying license from Amateur or Private Pilot for Sport flying to Limited Commercial or Transport Pilot for professional flying—or for the Airplane and Engine mechanics licenses as issued by the U. S. Bureau of Air Commerce.

This highest federal rating, the years of experience, the ideal training location on famous Roosevelt Field, the expert staff of rated instructors and the unsurpassed, modern training equipment of this internationally recognized institution of aeronautical instruction assures you of the most complete and practical training in the course of your choice at no extra cost than for ordinary instruction. Only thorough training is effective and productive—get it at Roosevelt.

For information write or phone (Garden City 8000) or visit the School. Ask for free booklet (AA). Kindly state age and course.

TRAIN AT A SCHOOL THAT IS IN THE BUSINESS IT TEACHES.

ROOSEVELT AVIATION SCHOOL

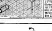
ROOSEVELT FIELD — MINEOLA, N. Y.

As one reader of AVIATION to another
during 1936, and thereafter, you can always reach me through the "Classified" columns of AVIATION. If you want to buy, sell, or trade, planes, engines, or parts, let me hear from you. We may be able to make a deal.

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS
Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Dean, College of Engineering
NEW YORK UNIVERSITY
University Heights, New York, N. Y.

WHERE TO BUY

NEW EQUIPMENT—ACCESSORIES—MATERIALS—SUPPLIES



3-Dimension sketches in plant or field—WOOD'S ISOMETRIC in pads 4x8½—100 8½x11—50 in 1/4 17x22 sheets with directions—$1.00. At office and drawing supply dealers or Wood Instrument Co., Box 2274 A, Dover, N. J.

? ? ? ?
Find what you are looking for? If this or other advertising in this issue does not supply the information wanted, of products or services, write
AVIATION
330 W. 42d St., New York, N. Y.

POWERFUL, NON-MARRING ACCURATE BLOWS
for assembly and "top-over-all"
for the endless taking apart and putting together standardize on Chicago Rawhide Hammers to prevent battering and breakage of tools and machine parts. Balanced malleable iron heads, replaceable, non-marring faces of rolled, compressed tough treated hard rawhide. More accurate and enduring hand
Chicago Rawhide Mfg. Co.
1296 Elston Avenue
Chicago
U.S.A.

CHICAGO RAWHIDE HAMMERS
Write for Catalog—Hammers, Mallets, Mauls

STANDARD AIRCRAFT FINISHES
Since 1913
TITANINE
TITANINE INC. UNION, N. J.

NOC-OUT
THE HOSE CLAMP
WITH THE THUMBSCREW
Standard equipment hose clamp of the automotive and airplane industry. Your jobber has them.
4307 W 24th PL., CHICAGO, ILL. WITTEK MFG. CO.

PHENIX NITRATE DOPES—None better!
Clear—$1.10 per gal. in 55-gal. drums, included.
Clear—$1.15 per gal. in 30 gal. drums, included.
Clear—$1.45 per gal. in 5-gal. boxed cans.
Thinner—$1.10 per gal. in 5 gal. boxed cans.
Pigmented—$1.11 per gal. in 5 gal. boxed cans.
Yellow, Blue, Green, Red, Cream, Galatea, Khaki, Aluminum, Black, White. All fresh made from new and high grade materials. Immediate shipments.
PHENIX AIRCRAFT PRODUCTS CO.
Williamsville, N. Y.

COPY FOR THIS PAGE IS REQUIRED BY JANUARY 20th FOR THE FEBRUARY ISSUE

INDEX TO ADVERTISERS

CENTRAL AIRLINER

OVER PUT-IN-BAY, NEAR SANDUSKY, OHIO
ADMIRAL OLIVER PERRY, MONUMENT

THE B. G. CORPORATION

Contractors to the United States Army and Navy and Aircraft Engine Builders

136 W. 52nd ST., NEW YORK

Cable Address: Golsteco, New York

Improved engine performance results from close fin spacing made possible by advances in foundry practice.

Greater use of extruded shapes is resulting in measurable economies.

The type of assembly on which new spot-welding developments will save money.

An example of parts now being formed from strong alloys without heat treating by the aircraft manufacturer.

THERE IS JUST ONE REASON

for the increasing use of

ALUMINUM

The increasing use of Aluminum, by more builders in more parts of the ship, is a reflection of the emphasis we have put upon product developments and process developments which would directly benefit the aircraft industry.

We feel a definite professional obligation to the aircraft industry. Nature made Aluminum light, it is *our* responsibility to do everything possible to make that lightness help achieve the industry's basic objective: lower cost per passenger-mile with safety and reliability.

With magnificent co-operation from the industry itself, that work is going forward on three distinct fronts: (1) Alloy development, such as 24S and 52S. (2) Improvement in manufacturing techniques, such as the recent forging and sand-casting developments. (3) Improvement of fabrication techniques, in the aircraft factory itself, to obtain greater economies.

These developments are resulting in major economies for many builders, and in lessened maintenance for many operators. If you are not as yet taking advantage of these developments, perhaps it is because we have not had the opportunity of laying all the facts before you. We would welcome that privilege. ALUMINUM COMPANY OF AMERICA, 2182 Gulf Building, Pittsburgh, Pa.

ALCOA

ALCOA · ALUMINUM

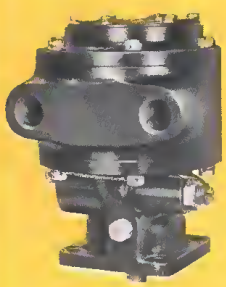
Certainty

. . . served admirably by Eclipse Air Pump Equipment

INSURING reliable operation of air-driven types of aircraft navigating instruments—turn and bank indicator, directional gyro, artificial horizon and the "automatic pilot"—Eclipse Vacuum Instrument Pumps enhance the flying certainty of thousands of aircraft.

Supplementing the operation of instruments, the Eclipse air pumps can also be used in conjunction with the Eclipse mechanical de-icer equipment and Goodrich De-icers as a means of removing ice formation during flight.

ECLIPSE AVIATION CORPORATION
EAST ORANGE, N. J.
{Subsidiary of Bendix Aviation Corporation}



Left: Type B-2 Vacuum Pump for Instrument operation only.

Right: Type B-1 Pump for Instrument and De-Icer operation.

ECLIPSE